

Ballast Water Management System
with PERACLEAN® Ocean “SKY-SYSTEM®”

Report of Shipboard Test

Date Submitted: May 15, 2014

NIPPON YUKA KOGYO Co., Ltd.

KATAYAMA CHEMICAL INC.

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Ballast Water Management System
with PERACLEAN® Ocean “SKY-SYSTEM®”

Report of Shipboard Test

Date Submitted: May 15, 2014

Laboratory of Aquatic Science Consultant Co., Ltd.



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Statement

Test Name

Shipboard tests on “SKY-SYSTEM[®] (TRC : 450m³/h)”

Test Number

T-03-140 (Shipboard test plan)

The shipboard tests by “SKY-SYSTEM[®] (TRC : 450m³/h)” is performed based on the “Guideline for approval of ballast water management systems (G8)” specified on Resolution MEPC.174 (58).

In order to conduct the test by means of adequate quality control based on international standards, Laboratory of Aquatic Science Consultant Co., Ltd. (hereafter LASC) has performed this test on the basis of the shipboard based test plan (T-03-140), and “QUALITY MANAGEMENT PLAN (QMP) AND QUALITY ASSURANCE PROJECT PLAN (QAPP) OF THE APPROVAL TESTING PROCESS (D-01-140)” ,taking into consideration ISO/IEC17025 in accordance with quality control system (JIS Q 9001:2000 ISO 9001:2000 qualified) which is intended to consistently supply products to comply with client requirements and applicable regulations, increasing client satisfaction by all of us through the continuous improvement and effective application of the system.

Person in charge of tests:

Laboratory of Aquatic Science Consultant Co. Ltd.

(May 15, 2014)

Takuo Omura

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Quality Assurance Written Statement

Test Name

Shipboard tests on “SKY-SYSTEM[®] (TRC:450m³/h)”

Test Number

T-03-140 (Shipboard test plan)

Concerning this test, inspection or audit by the person in charge of quality assurance operations was effected as follows, of which results were reported to the person responsible for the test.

Date of inspection and audit	Scope and items of inspection and audit	Date of report
Aug. 31, 2010 (May 11, 2012)	Test plan (final edition)	Aug. 31, 2010 (May 11, 2012)
May 18, 2012	Test facility / component / instrument/ SOP etc.	May 18, 2012
Sep. 7 and Sep. 21, 2012	Progress of test performance	Sep. 7 and Sep. 21, 2012
Mar. 14, 2014	Interim-report (draft)	Mar. 14, 2014
May 15, 2014	Final report	May 15, 2014

We hereby certify that each of the above-mentioned tests was conducted in accordance with the test plan and that the original data obtained from the relevant test were precisely reflected in this report.

Person responsible for the test quality assurance operations:

Laboratory of Aquatic Science Consultant Co., Ltd.

_____ (May 15, 2014)
Yuji Kagami

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LIST OF CONTENTS

1. APPLICATION	1
2. SUMMARY OF THE TEST RESULT.....	1
3. SCHEDULE FOR THE TEST.....	3
4. TEST RESULT	4
4.1 OPERATION TEST.....	4
4.2 PERFORMANCE TEST	122
L SIZE GROUP	
(Organisms of greater than or equal to 50 micrometer in minimum dimension)	122
S SIZE GROUP	
(Organisms of greater than or equal to 10 micrometers and less than 50 micrometers in minimum dimension)	123
BACTERIA	125
WATER QUALITY.....	127

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1. APPLICATION

The shipboard test of “SKY-SYSTEM[®] (TRC:450m³/h)” was effected by this test on the basis of “Guideline for approval of ballast water management systems (G8)” specified on Resolution MEPC.174 (58).

In order to conduct the test by means of adequate quality control based on international standards, Laboratory of Aquatic Science Consultant Co., Ltd. (hereafter referred to as LASC) has performed this test on the basis of the shipboard test plan (T-03-140), and “QUALITY MANAGEMENT PLAN (QMP) AND QUALITY ASSURANCE PROJECT PLAN (QAPP) OF THE APPROVAL TESTING PROCESS (D-01-140)” ,taking into consideration ISO/IEC17025 in accordance with quality control system (JIS Q 9001:2000 ISO 9001:2000 qualified) which is intended to consistently supply products to comply with client requirements and applicable regulations, increasing client satisfaction by all of us through the continuous improvement and effective application of the system.

2. SUMMARY OF THE TEST RESULT

The test was conducted on the basis of “The test standard prior to performing Ballast Water Management System shipboard test (hereinafter, shipboard test standard)” for more than 6 months from May 11, 2012 to November 17, 2012, with respect to operation test on ballasting and de-ballasting (the purpose: verification of the system operating normally), of which period at the time of the test on ballasting and de-ballasting on Sep. 7-8, Sep. 21-22 and Oct. 5-6, 2012, the performance test of “SKY-SYSTEM[®] (TRC: 450m³/h)” (actual proof of the treated and discharged ballast water conforming to the discharged standard), was conducted.

In the operation test for the six above-mentioned months, any failure did not occur to the system and everything operated normally.

Moreover, in three performance tests (on ballasting and de-ballasting three tests for TRC: 450 m³/h on Sep. 7-8, Sep. 21-22 and Oct. 5-6, 2012), it was verified that the organism density (number of individuals of L-size group and S-size group) in the processing control water of the targeted tank on ballasting was 10 or more times of the ballast water discharged standard, and the organism density (number of individuals of L-size group and S-size group) in the processing control water of

the targeted tank on de-ballasting was larger than the ballast water discharged standard, while it was also verified that the organism density in the treated water on de-ballasting was less than the ballast water discharged standard in all the items (L-size group, S-size group, *Vibrio cholera* (O1 and O139), *Escherichia coli* and Intestinal *Enterococci*).

* L-size group: Organisms of greater than or equal to 50 micrometer in minimum dimension

** S-size group: Organisms of greater than or equal to 10 micrometers and less than 50 micrometers in minimum dimension

3. SCHEDULE FOR THE TEST

During the period of not less than six months from May 11, 2012, the performance test which confirms adaptation to the International Ballast Water Management Convention D-2 standard was conducted at least 3 times with BWMS of TRC: 450m³/h. Furthermore, the operating conditions was recorded at the time of all the operations which use “SKY-SYSTEM[®] (TRC:450m³/h)” on the ballast operation of the main ship during the test period. Furthermore, the shipping route of the main ship is fundamentally Naha-Osaka-Tokyo-Osaka-Naha (one round in one week), and all the operations during the test period shall be tested.

The performance test of “SKY-SYSTEM[®] (TRC:450m³/h)” was conducted by the ballasting and de-ballasting tests of the schedule which are shown in Table 3-1.

Table 3-1 List of performance test implementation dates

Number of test	Ballasting	De-ballasting
1 st	Sep. 7, 2012	Sep. 8, 2012
2 nd	Sep. 21, 2012	Sep. 22, 2012
3 rd	Oct. 5, 2012	Oct. 6, 2012

4. TEST RESULT

4.1 OPERATION TEST

The recording items in this test are as the following table (Table 4-1-1). The system operation data and operating conditions of the ballasting and de-ballasting test for six months of “SKY-SYSTEM® (TRC:450m³/h)” are summarized by working day and shown in the figure 4-1-1 (1) - (114). Furthermore, a working (operating) day list is shown in Table 4-1-2 (1) - (3).

Furthermore, the frame shown by the blue line and brown line in each graph represents the signal of having started BWMS rated treatment (blue on ballasting and brown on de-ballasting).

Table 4-1-1 Recording items

	Items	Remarks
1	Date and time	
2	Anchorage site (port name)	
3	Using ballast tank	Treated water storage tank Control water storage tank
4	Treated water flow volume (rate), flow volume (rate) of control water on ballasting	
5	Treated water flow volume (rate), flow volume (rate) of control water on de-ballasting	
6	The amount of ballasting ballast water in the treated water tank and the control water tank	
7	Ballasting and de-ballasting start time and finish time	
8	Ballasting and de-ballasting time	
9	The control status of injection volume, concentration, etc. of PERACLEAN® Ocean at the time of ballasting treatment	
10	The concentration of Monitoring Unit-1 and 2 of the active substance at the time of de-ballasting treated water	Active substance: PAA and H ₂ O ₂
11	The control status of neutralization treatment: The additive amount and concentration of the neutralizer at the time of de-ballasting treated water, and concentration of Monitoring Unit-2 of the active substance at the time of (or after) addition	Neutralizer: Sodium sulfite (Na ₂ SO ₃) Active substance: PAA and H ₂ O ₂
12	Sampling flow volume at the time of each sampling	Performance tests (PT)
13	Existence of system operation failure and contents of the failure incurred	
14	Other matters required	

Table 4-1-2 (1) List of working day

Date	Ballasting	De-Ballasting	Anchorage site	Remarks
2012/5/11	○	○	Ariake/Tokyo	
2012/5/12	○	○	Osaka	
2012/5/14		○	Naha/Okinawa	
2012/5/15	○		Naha/Okinawa	
2012/5/17	○	○	Osaka	
2012/5/18	○	○	Ariake/Tokyo	
2012/5/19	○	○	Osaka	
2012/5/21		○	Naha/Okinawa	
2012/5/22	○	○	Naha/Okinawa	
2012/5/24	○		Osaka	
2012/5/25	○	○	Ariake/Tokyo	
2012/5/26	○	○	Osaka	
2012/5/28	○		Naha/Okinawa	
2012/5/29	○		Naha/Okinawa	
2012/5/31	○	○	Osaka	
2012/6/1	○	○	Ariake/Tokyo	
2012/6/2		○	Osaka	
2012/6/4	○	○	Naha/Okinawa	
2012/6/5	○		Naha/Okinawa	
2012/6/7		○	Osaka	
2012/6/8	○	○	Ariake/Tokyo	
2012/6/9	○	○	Osaka	
2012/6/11	○		Naha/Okinawa	
2012/6/12	○		Naha/Okinawa	
2012/6/14	○		Osaka	
2012/6/15	○	○	Ariake/Tokyo	
2012/6/16	○	○	Osaka	
2012/6/18	○	○	Naha/Okinawa	
2012/6/19		○	Naha/Okinawa	
2012/6/21	○	○	Osaka	
2012/6/23	○		Osaka	
2012/6/26	○	○	Naha/Okinawa	
2012/6/28	○	○	Osaka	
2012/6/29	○	○	Ariake/Tokyo	
2012/6/30	○	○	Osaka	
2012/7/2	○	○	Naha/Okinawa	
2012/7/3		○	Naha/Okinawa	
2012/7/5	○	○	Osaka	
2012/7/6	○	○	Ariake/Tokyo	
2012/7/7		○	Osaka	

Table 4-1-2 (2) List of working day

Date	Ballasting	De-Ballasting	Anchorage site	Remarks
2012/7/9	○		Naha/Okinawa	
2012/7/12	○	○	Osaka	
2012/7/13	○	○	Ariake/Tokyo	
2012/7/14	○	○	Osaka	
2012/7/16	○		Naha/Okinawa	
2012/7/17		○	Naha/Okinawa	
2012/7/19		○	Osaka	
2012/7/20	○	○	Ariake/Tokyo	
2012/7/21		○	Osaka	
2012/7/23	○		Naha/Okinawa	
2012/7/24	○	○	Naha/Okinawa	
2012/7/26	○		Osaka	
2012/7/27	○	○	Ariake/Tokyo	
2012/7/28	○	○	Osaka	
2012/8/2	○	○	Osaka	
2012/8/3	○	○	Ariake/Tokyo	
2012/8/4	○	○	Osaka	
2012/8/6		○	Naha/Okinawa	
2012/8/7	○	○	Naha/Okinawa	
2012/8/9	○		Osaka	
2012/8/10	○	○	Ariake/Tokyo	
2012/8/11	○	○	Osaka	
2012/8/13	○		Naha/Okinawa	
2012/8/16	○		Osaka	
2012/8/17	○	○	Ariake/Tokyo	
2012/8/18	○	○	Osaka	
2012/8/20	○		Naha/Okinawa	
2012/8/21	○	○	Naha/Okinawa	
2012/8/23	○		Osaka	
2012/8/24	○	○	Ariake/Tokyo	
2012/8/25		○	Osaka	
2012/8/29	○		Naha/Okinawa	
2012/8/31	○	○	Osaka	
2012/9/1	○	○	Ariake/Tokyo	
2012/9/2		○	Osaka	
2012/9/4	○	○	Naha/Okinawa	
2012/9/7	○	○	Ariake/Tokyo	PT
2012/9/8	○	○	Osaka	PT
2012/9/10	○		Naha/Okinawa	
2012/9/13	○		Osaka	

*PT: Performance Test

Table 4-1-2 (3) List of working day

Date	Ballasting	De-Ballasting	Anchorage site	Remarks
2012/9/14	○	○	Ariake/Tokyo	
2012/9/15	○	○	Osaka	
2012/9/19	○	○	Naha/Okinawa	
2012/9/21	○	○	Ariake/Tokyo	PT
2012/9/22	○	○	Osaka	PT
2012/9/24	○	○	Naha/Okinawa	
2012/9/27	○	○	Osaka	
2012/9/28	○	○	Ariake/Tokyo	
2012/9/29	○	○	Osaka	
2012/10/2	○		Naha/Okinawa	
2012/10/4	○		Osaka	
2012/10/5	○		Ariake/Tokyo	PT
2012/10/6	○	○	Osaka	PT
2012/10/8	○		Naha/Okinawa	
2012/10/11	○		Osaka	
2012/10/12	○	○	Ariake/Tokyo	
2012/10/13	○		Osaka	
2012/10/15	○		Naha/Okinawa	
2012/10/19	○	○	Ariake/Tokyo	
2012/10/22	○		Naha/Okinawa	
2012/10/25	○		Osaka	
2012/10/26	○	○	Ariake/Tokyo	
2012/10/27	○	○	Osaka	
2012/10/29	○		Naha/Okinawa	
2012/11/2	○	○	Ariake/Tokyo	
2012/11/3		○	Osaka	
2012/11/5	○		Naha/Okinawa	
2012/11/6		○	Naha/Okinawa	
2012/11/8	○		Osaka	
2012/11/9	○	○	Ariake/Tokyo	
2012/11/10	○	○	Osaka	
2012/11/15	○	○	Osaka	
2012/11/16	○	○	Ariake/Tokyo	
2012/11/17		○	Osaka	

*PT: Performance Test

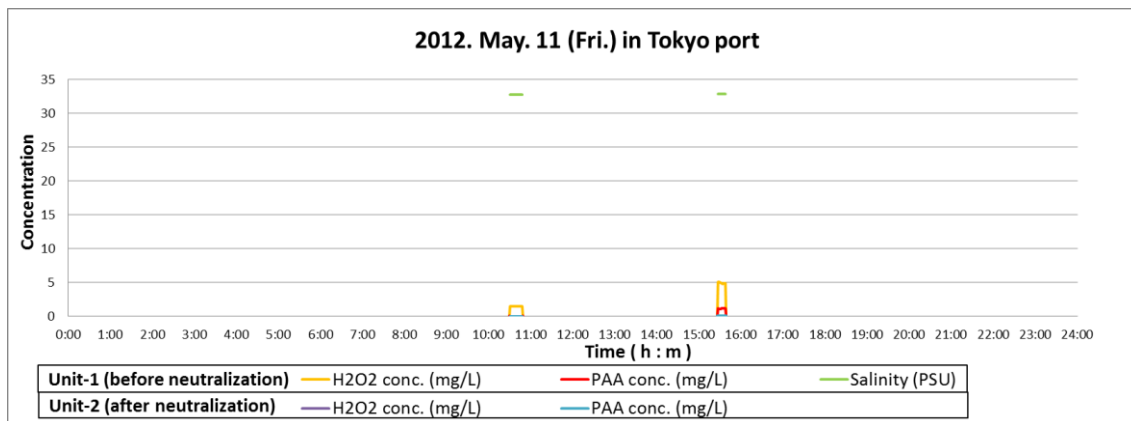
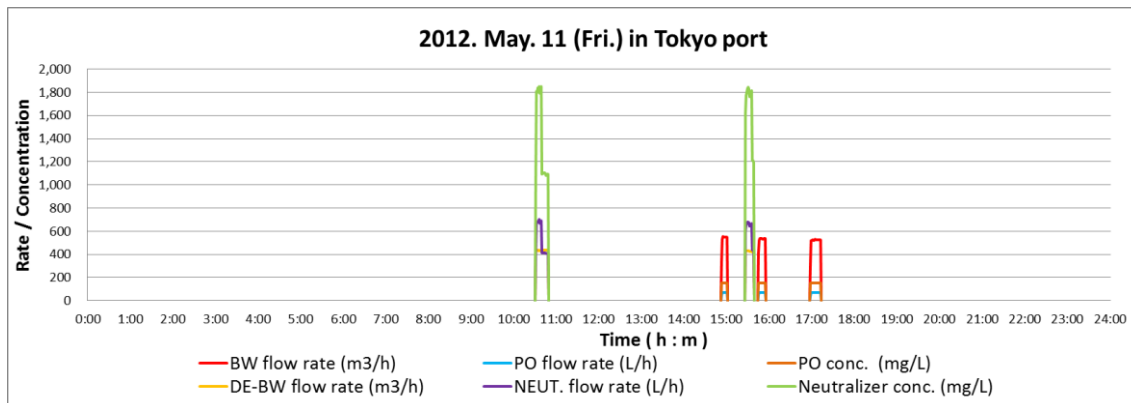


Figure 4-1-1(1) System operation data (2012/05/11)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

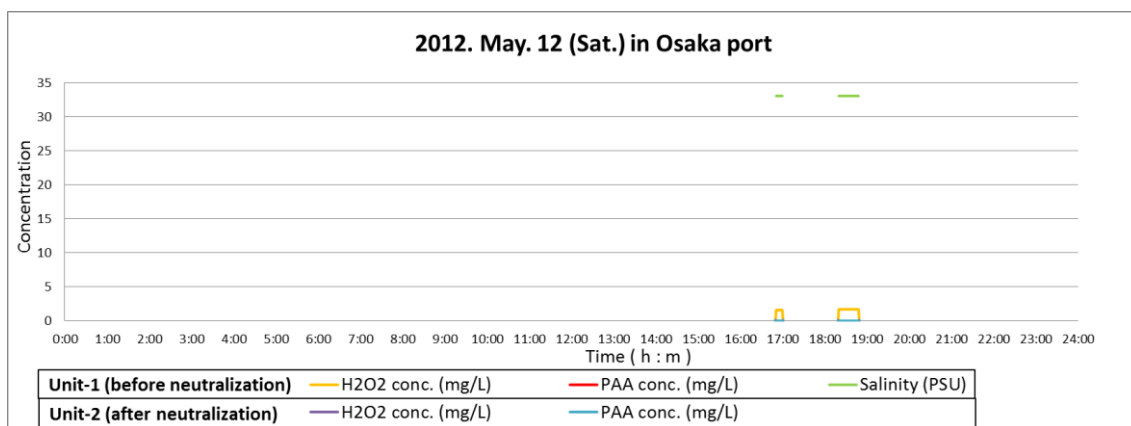
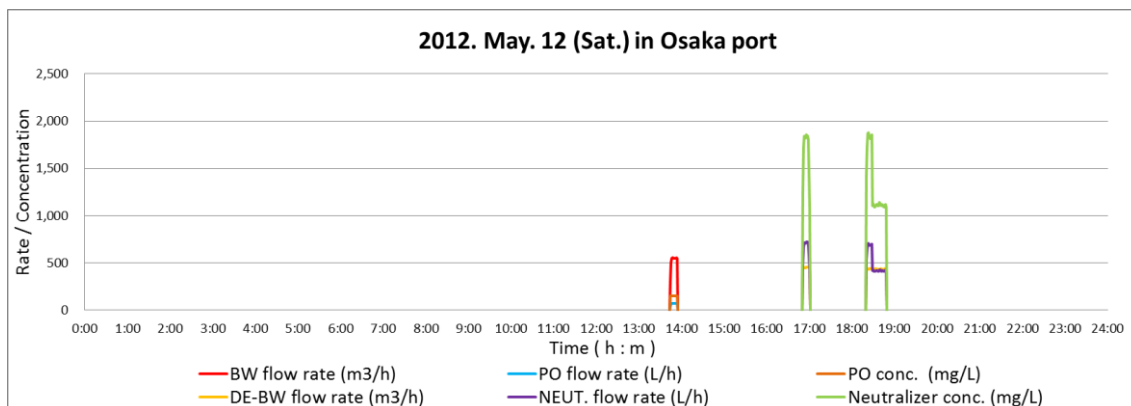


Figure 4-1-1(2) System operation data (2012/05/12)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

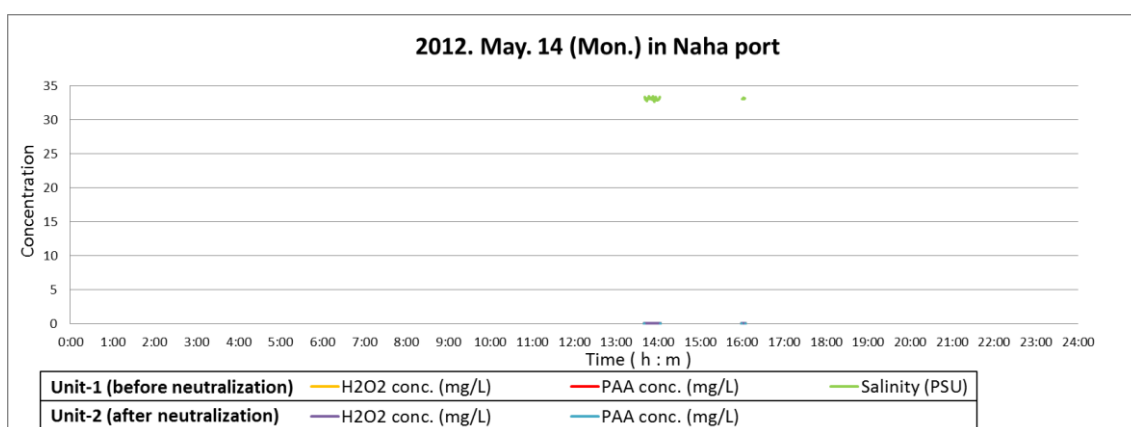
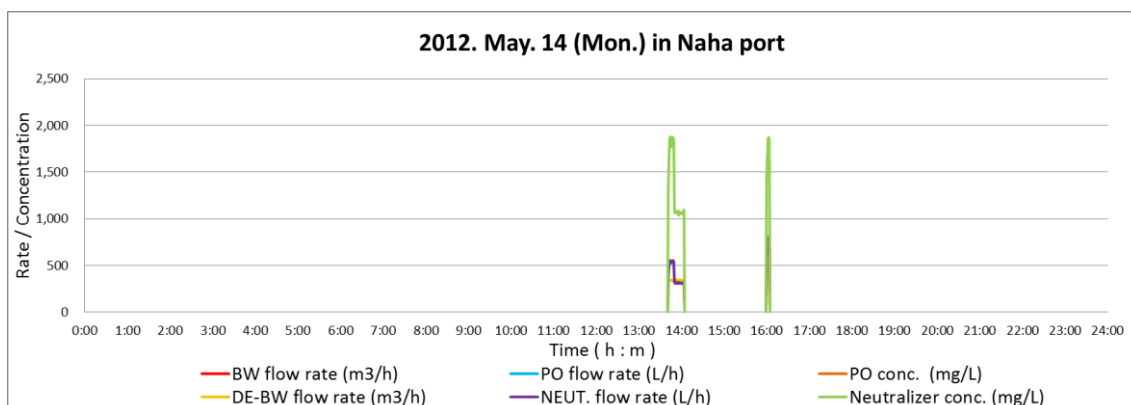


Figure 4-1-1(3) System operation data (2012/05/14)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

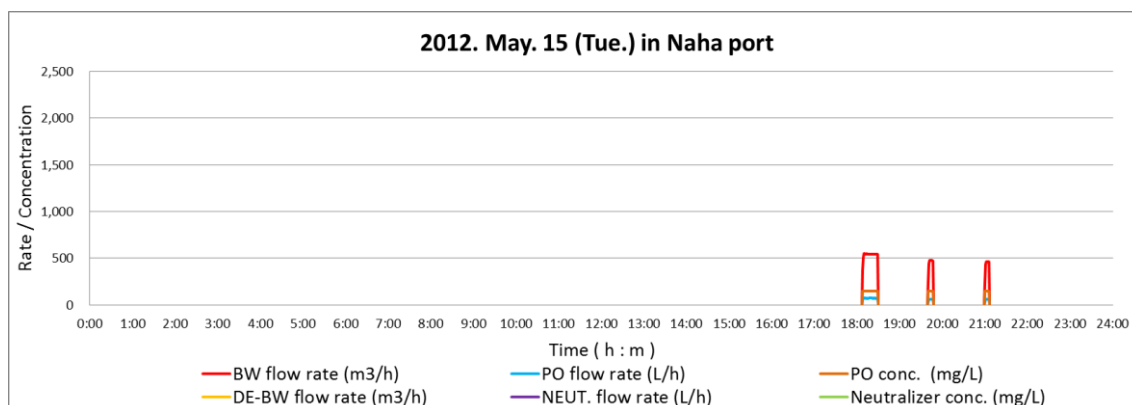


Figure 4-1-1(4) System operation data (2012/05/15)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

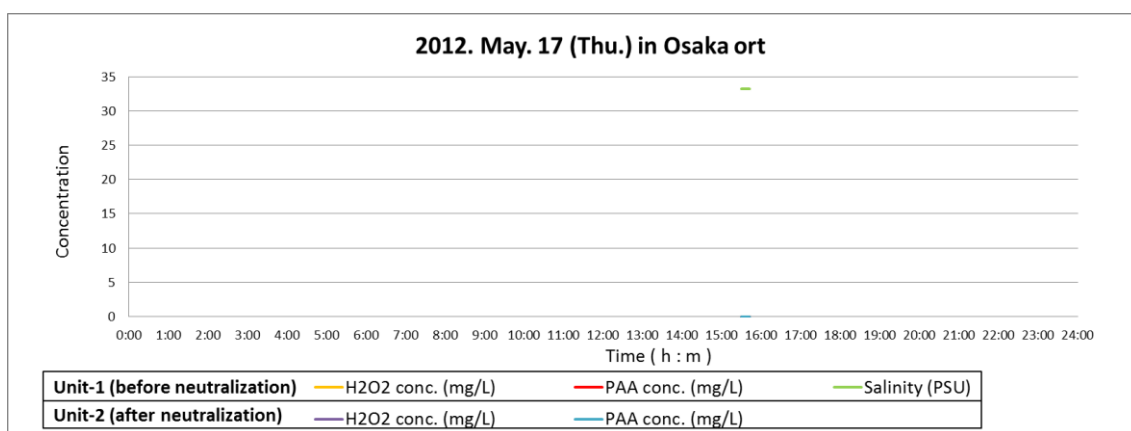
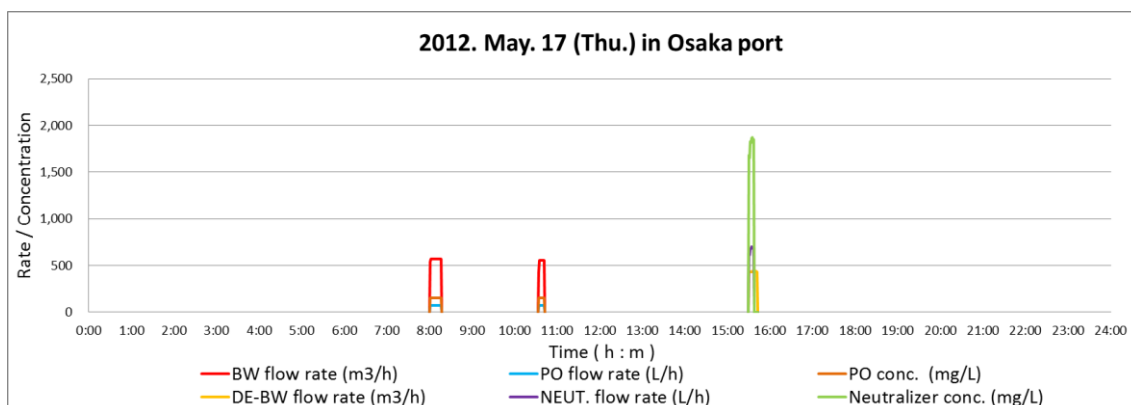


Figure 4-1-1(5) System operation data (2012/05/17)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

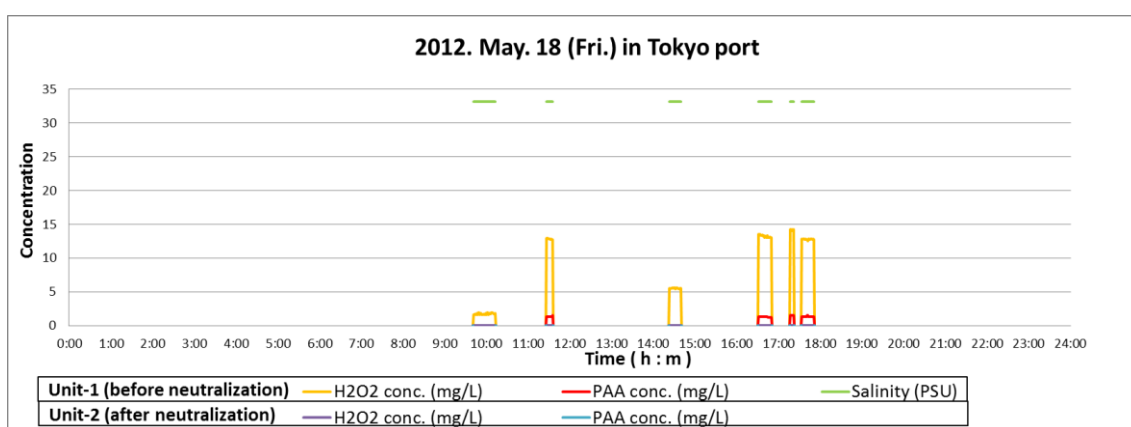
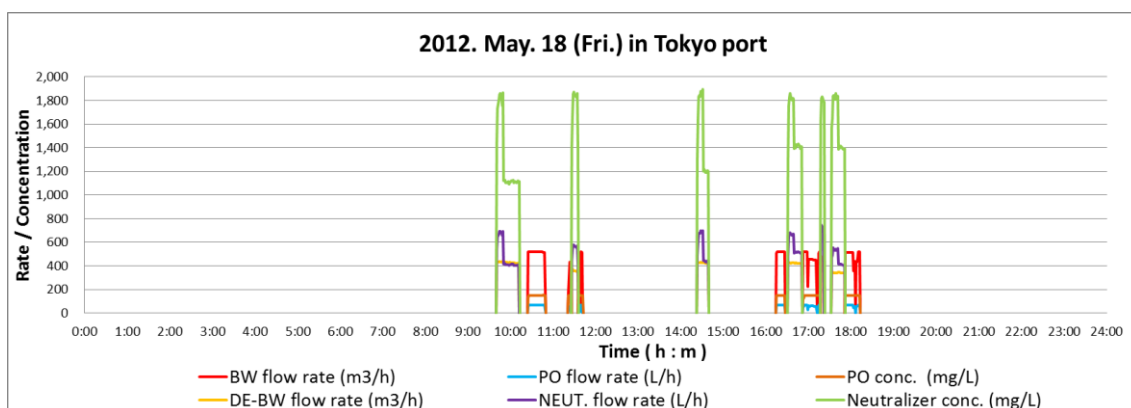


Figure 4-1-1(6) System operation data (2012/05/18)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

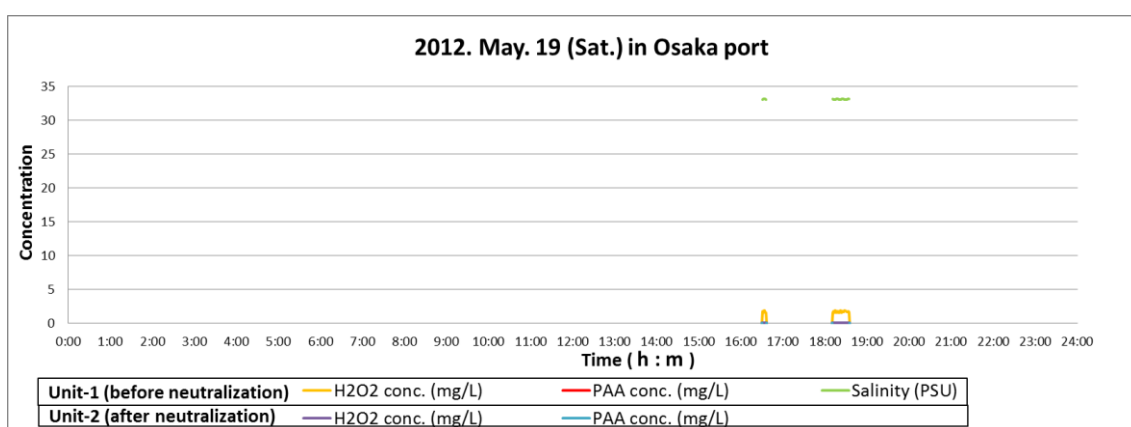
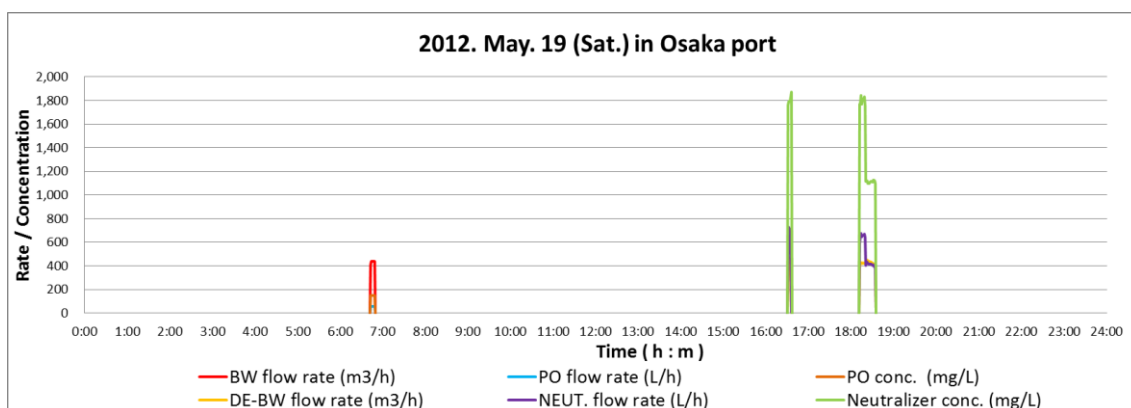


Figure 4-1-1(7) System operation data (2012/05/19)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

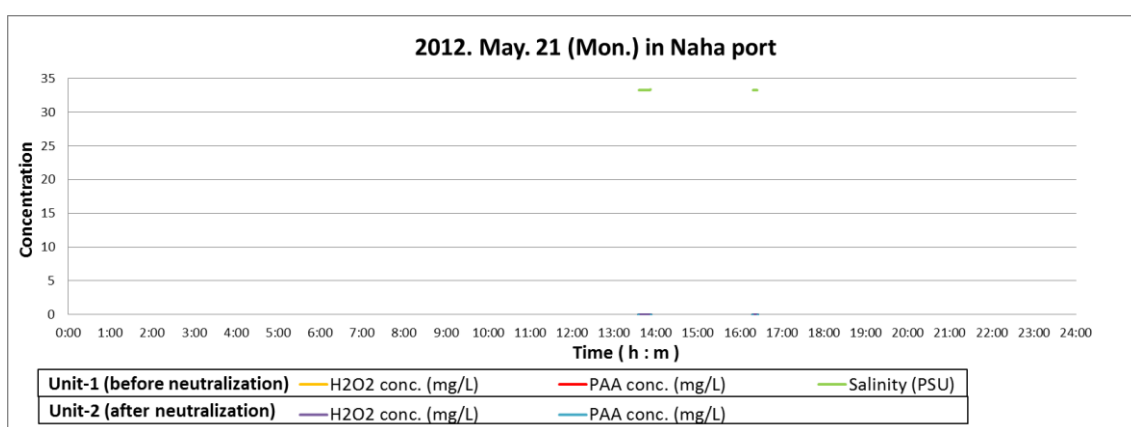
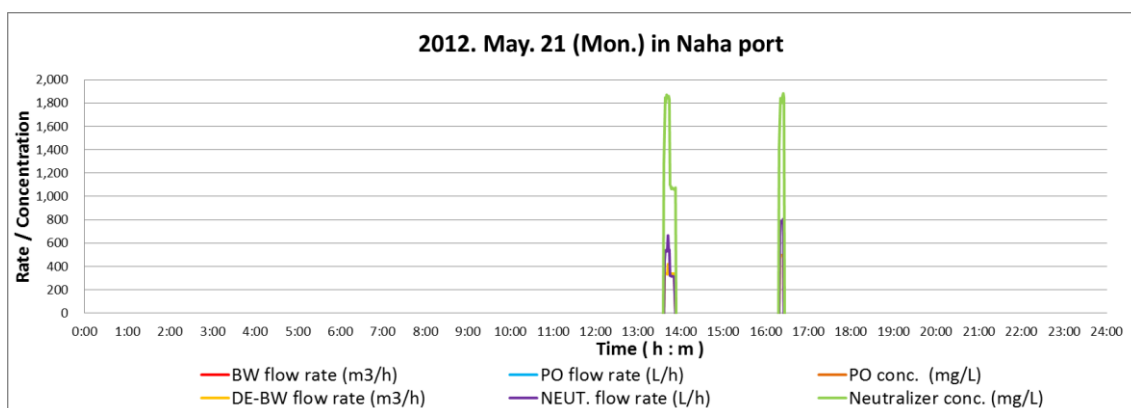


Figure 4-1-1(8) System operation data (2012/05/21)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

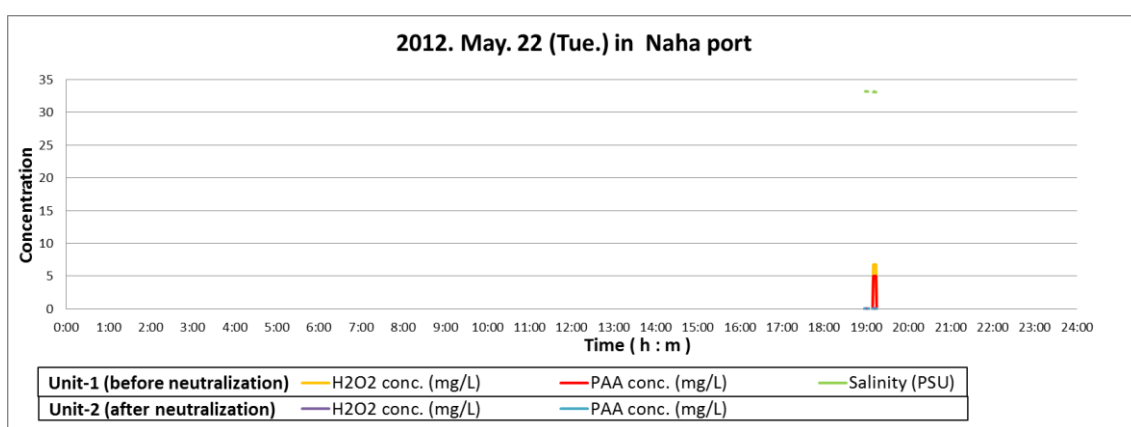
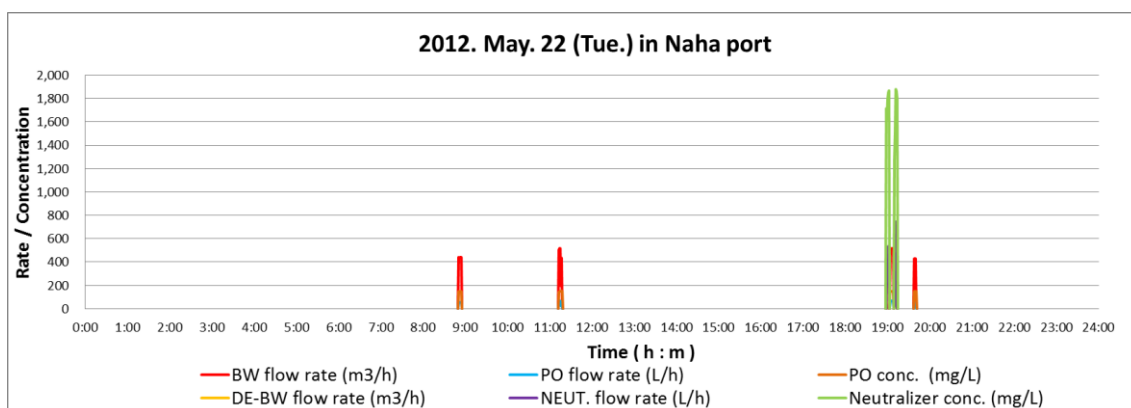


Figure 4-1-1(9) System operation data (2012/05/22)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

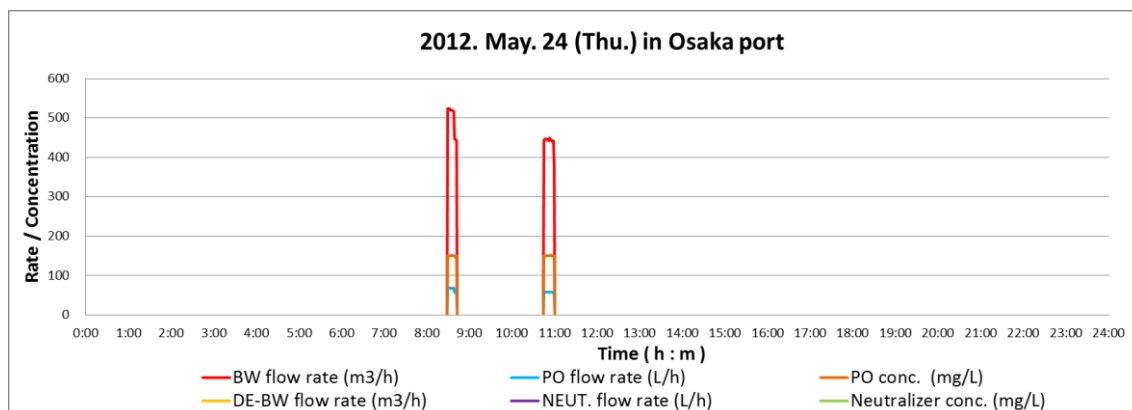


Figure 4-1-1(10) System operation data (2012/05/24)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

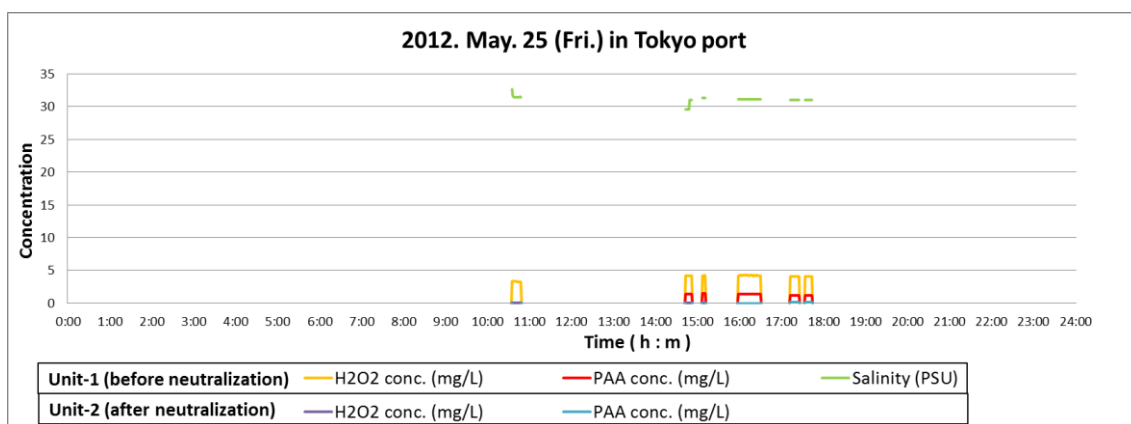
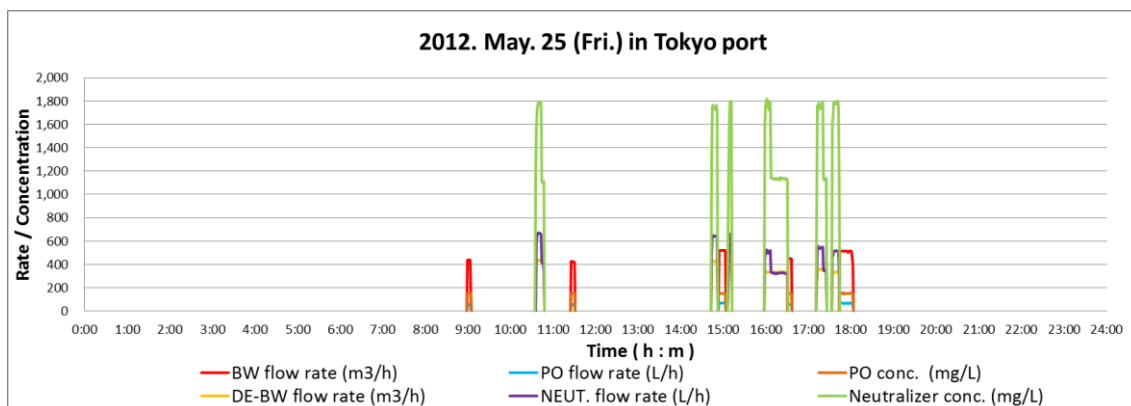


Figure 4-1-1(11) System operation data (2012/05/25)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

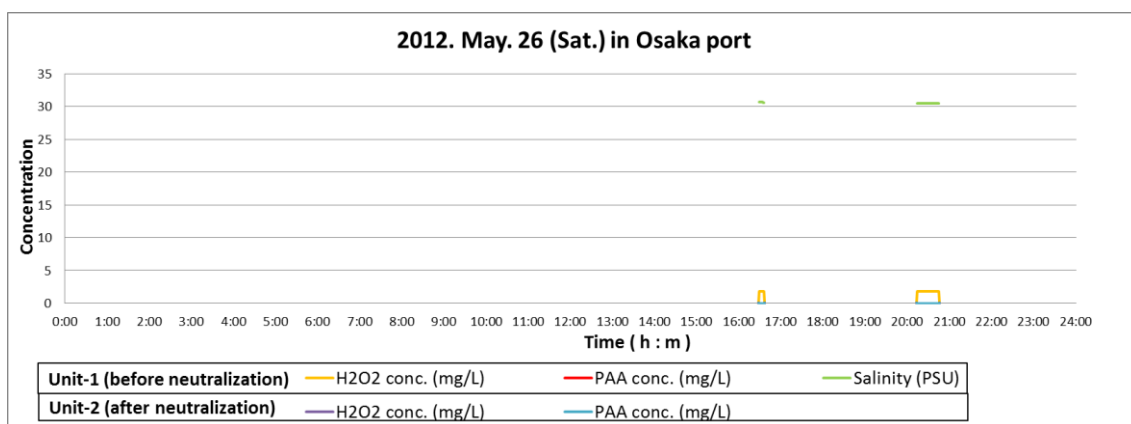
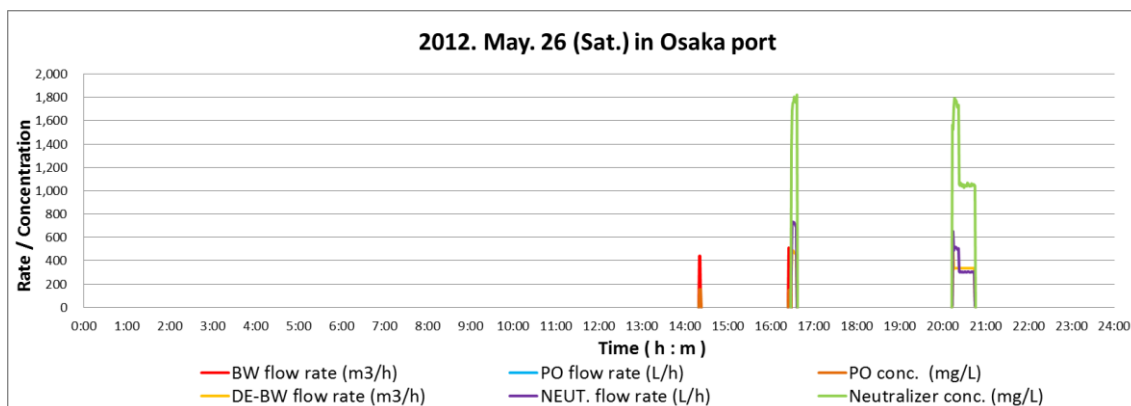


Figure 4-1-1(12) System operation data (2012/05/26)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

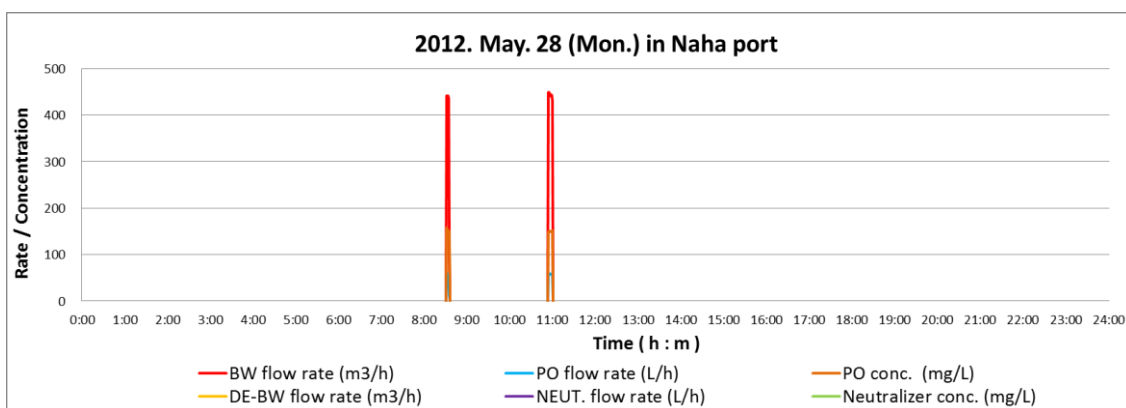


Figure 4-1-1(13) System operation data (2012/05/28)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

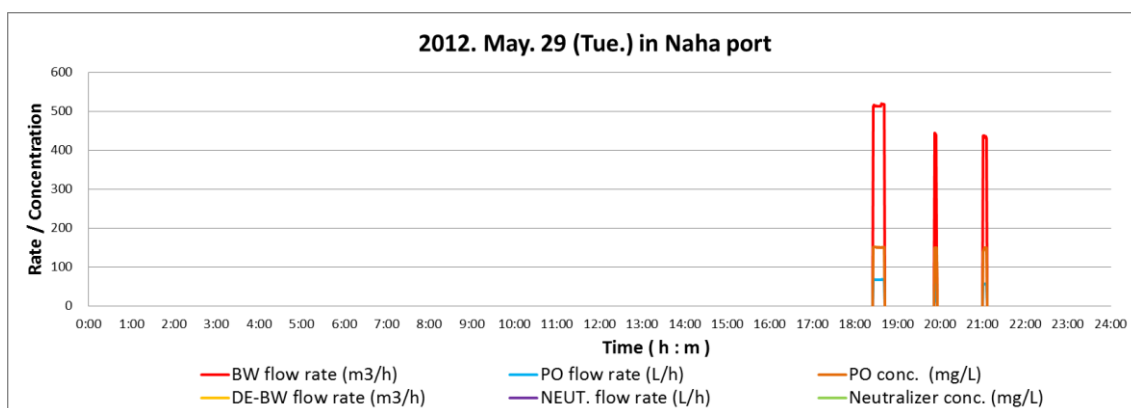


Figure 4-1-1(14) System operation data (2012/05/29)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

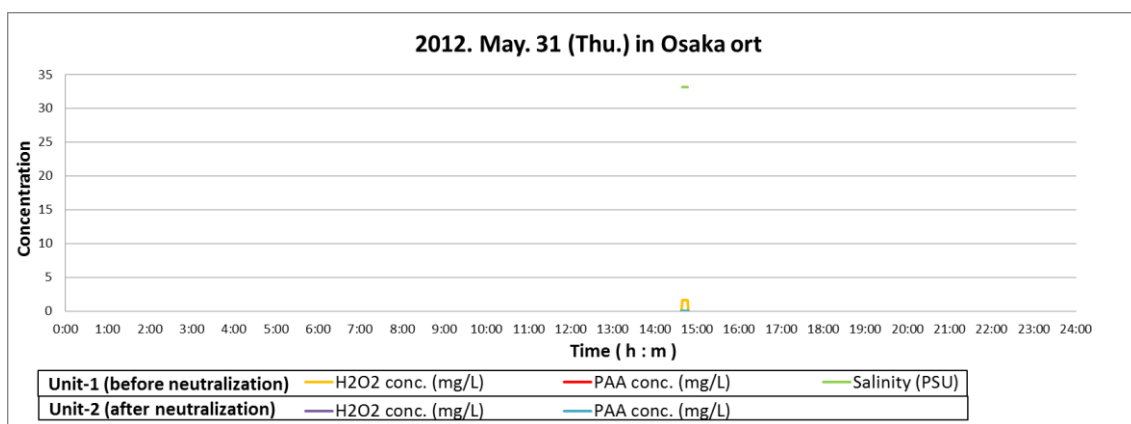
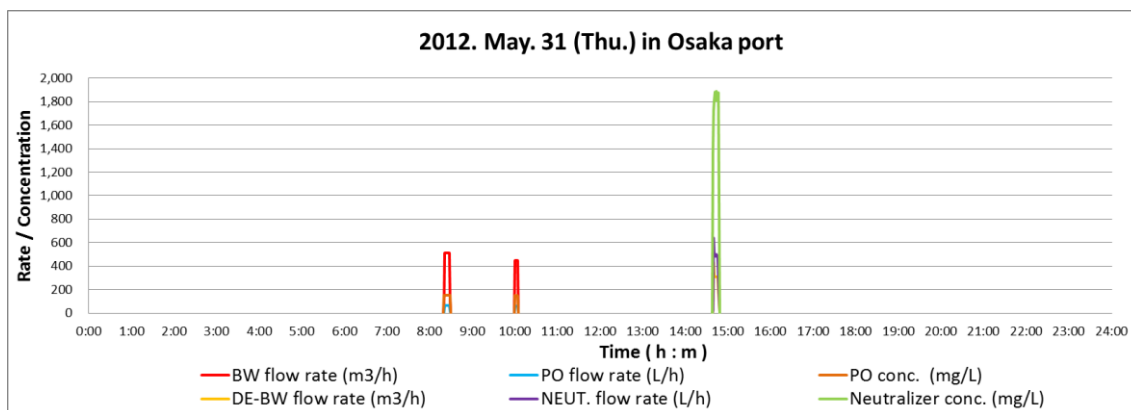


Figure 4-1-1(15) System operation data (2012/05/31)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

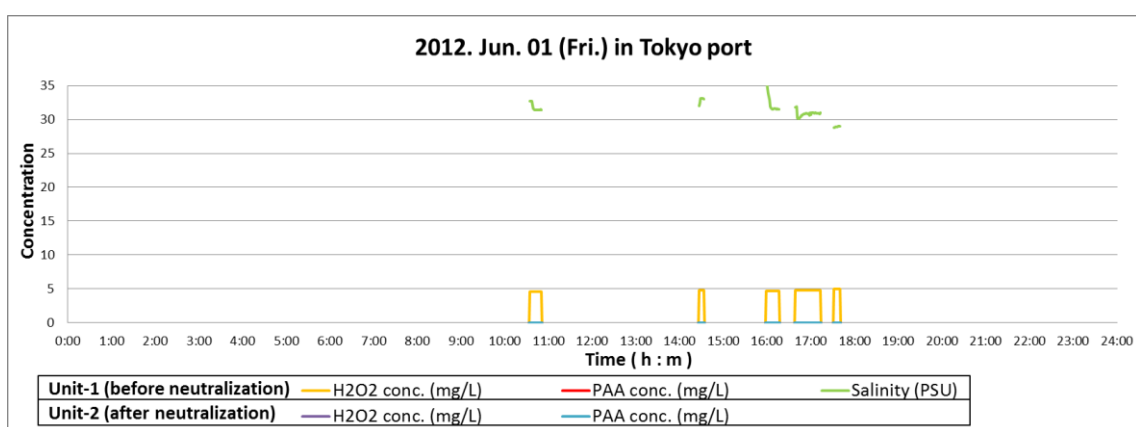
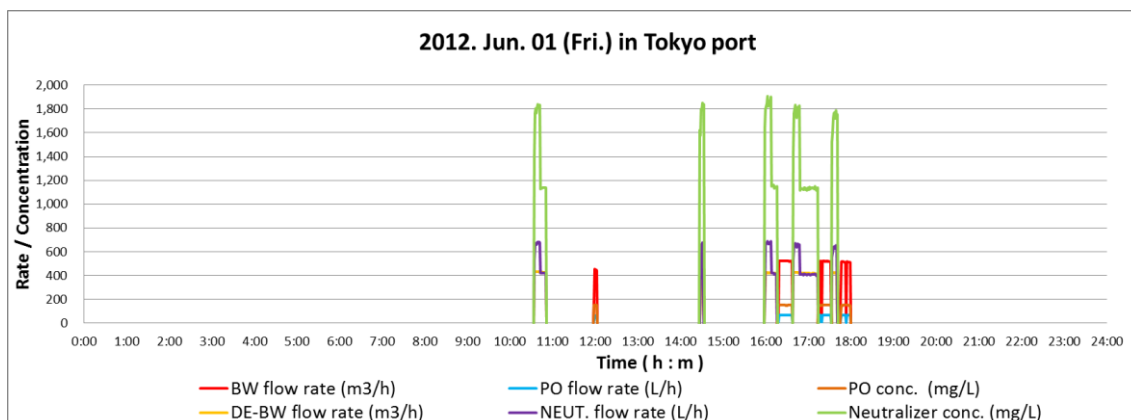


Figure 4-1-1(16) System operation data (2012/06/1)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

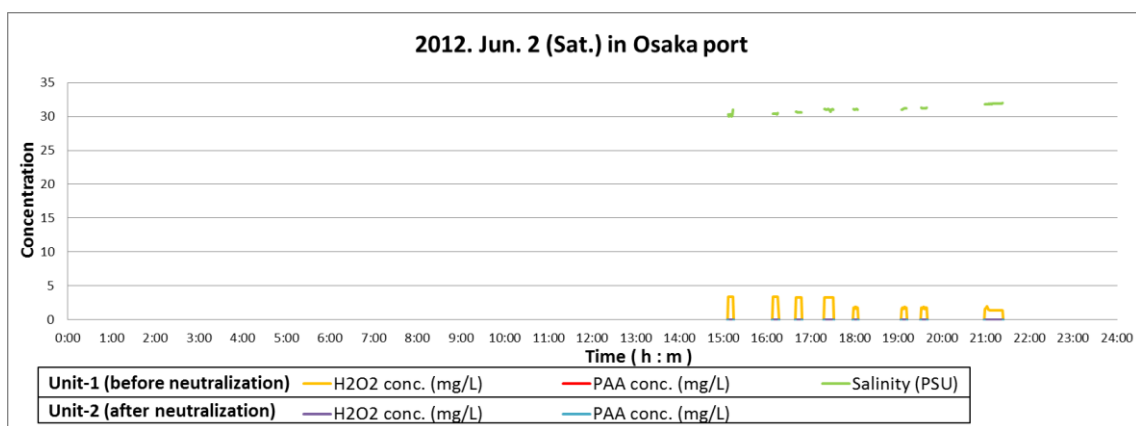
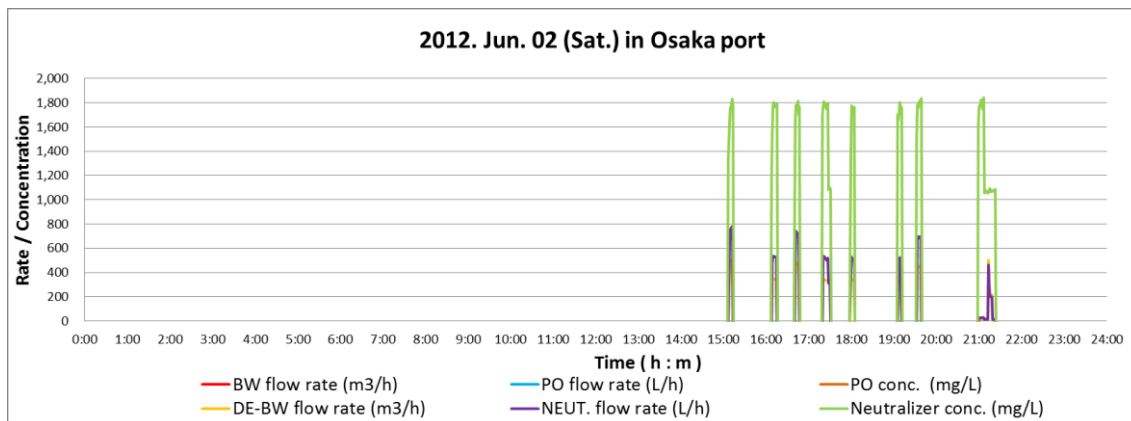


Figure 4-1-1(17) System operation data (2012/06/2)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

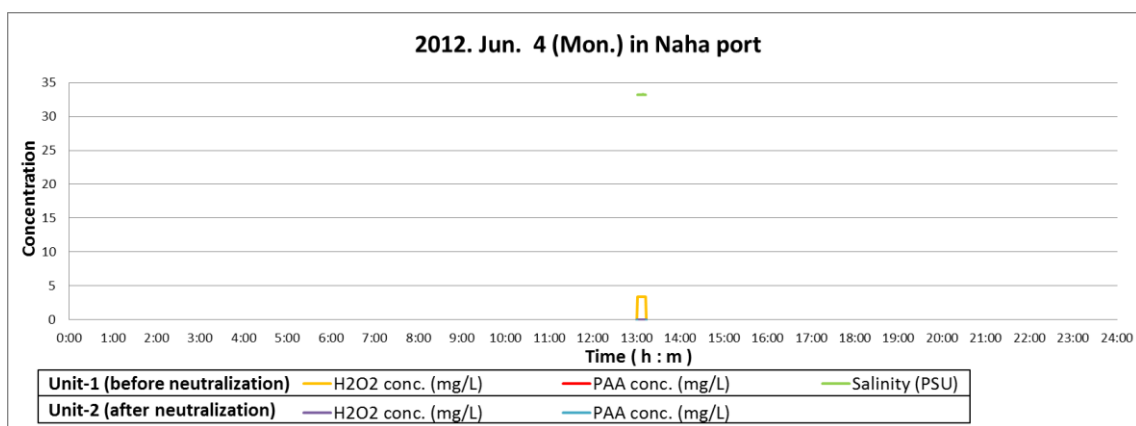
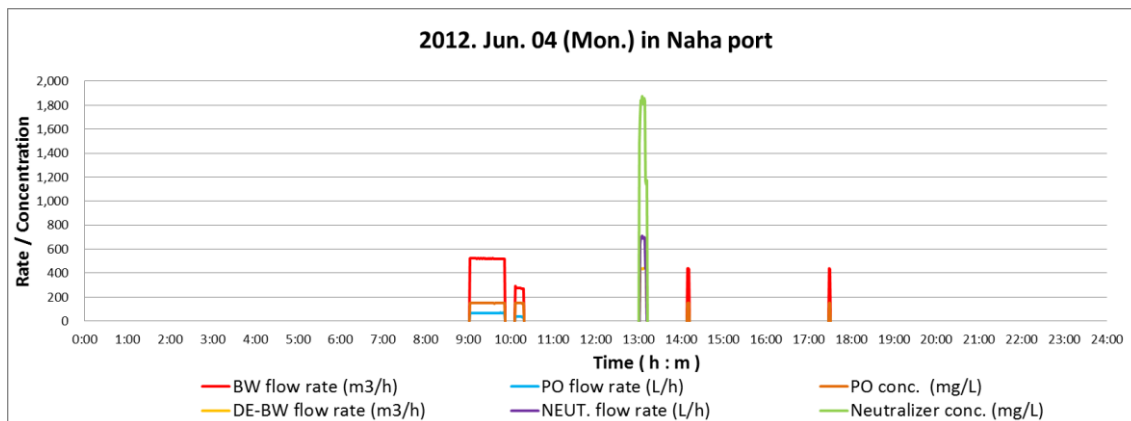


Figure 4-1-1(18) System operation data (2012/06/4)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

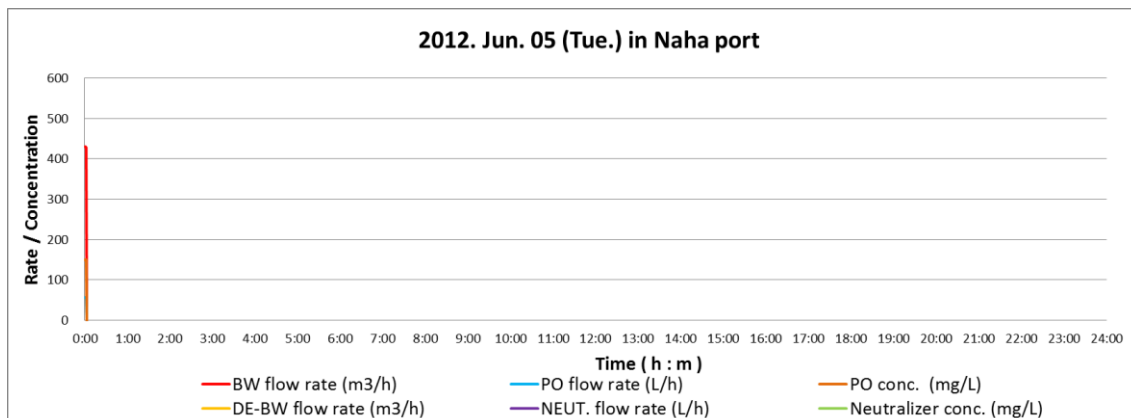


Figure 4-1-1(19) System operation data (2012/06/05)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

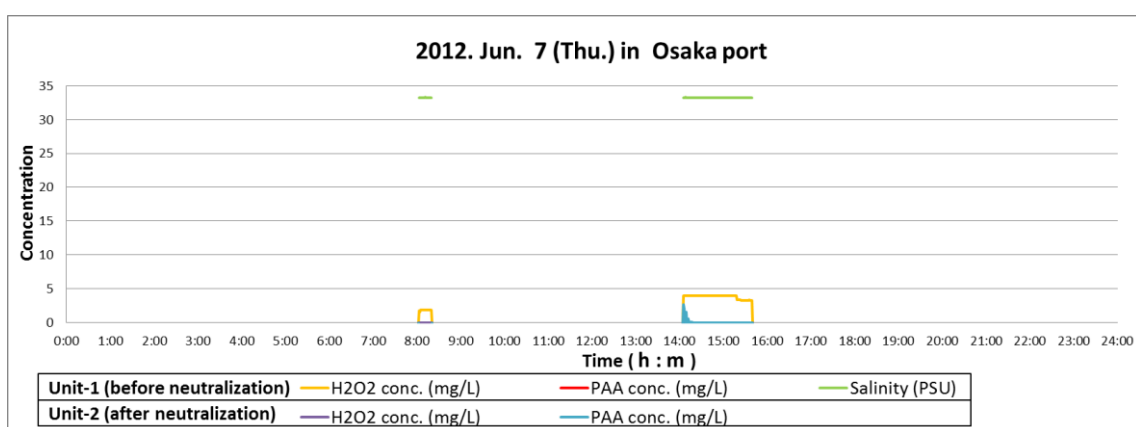
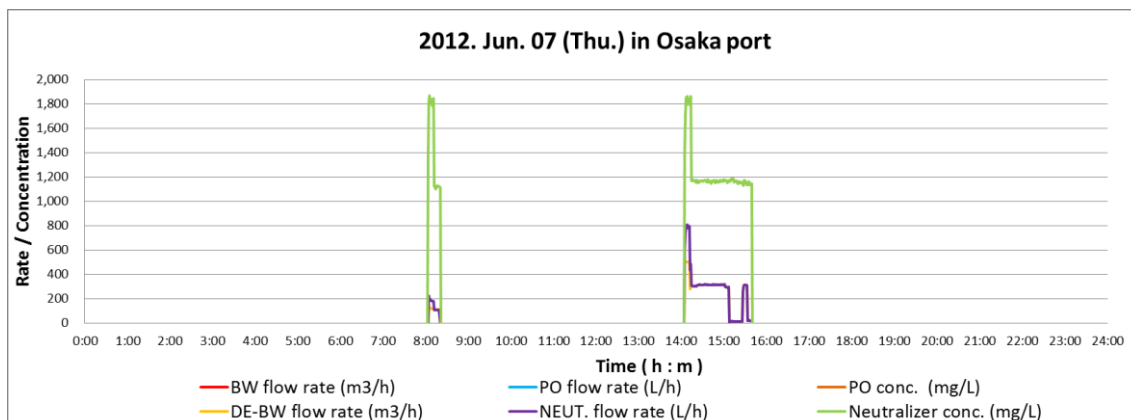


Figure 4-1-1(20) System operation data (2012/06/7)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

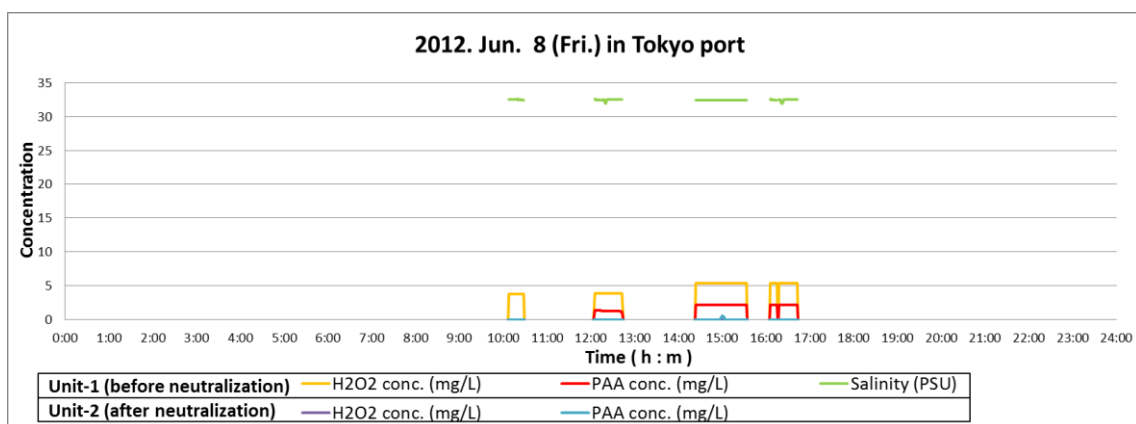
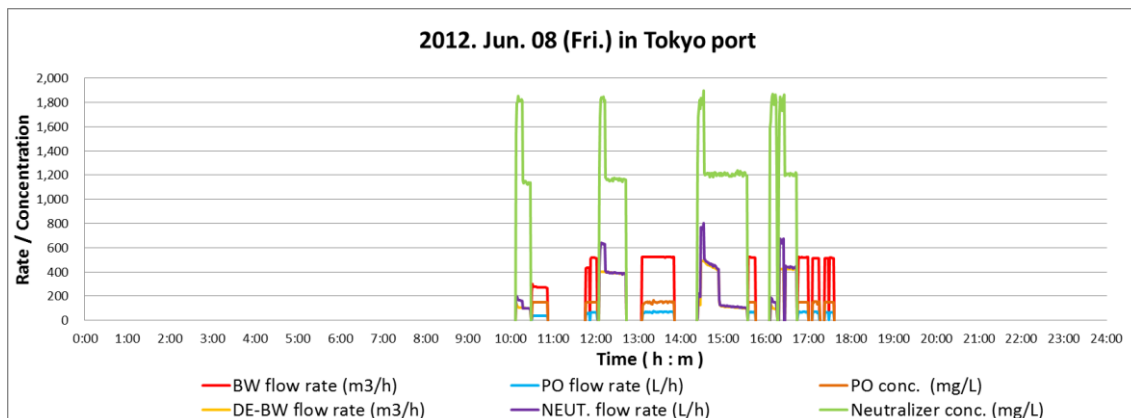


Figure 4-1-1(21) System operation data (2012/06/8)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

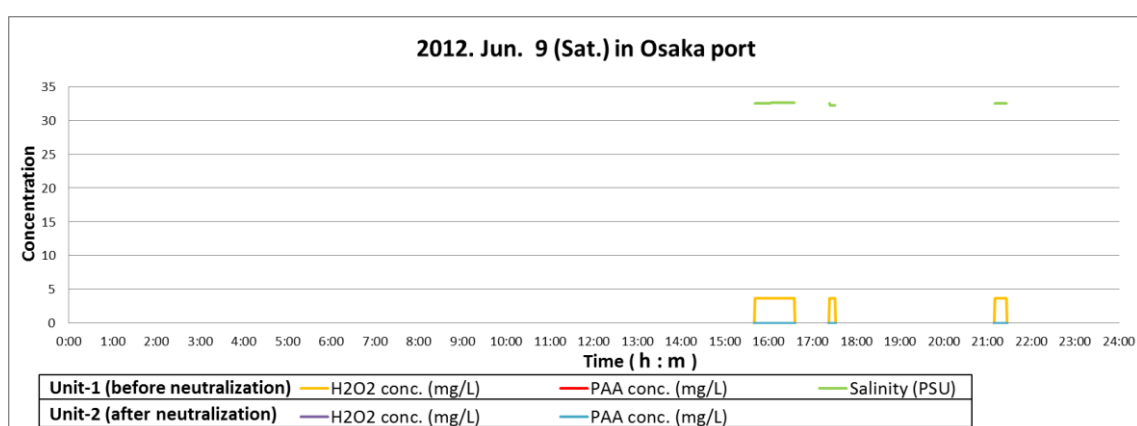
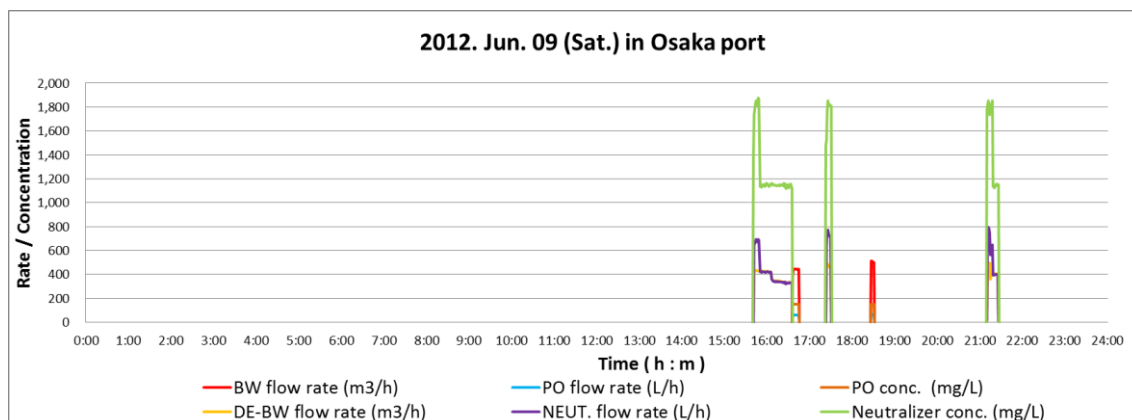


Figure 4-1-1(22) System operation data (2012/06/9)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

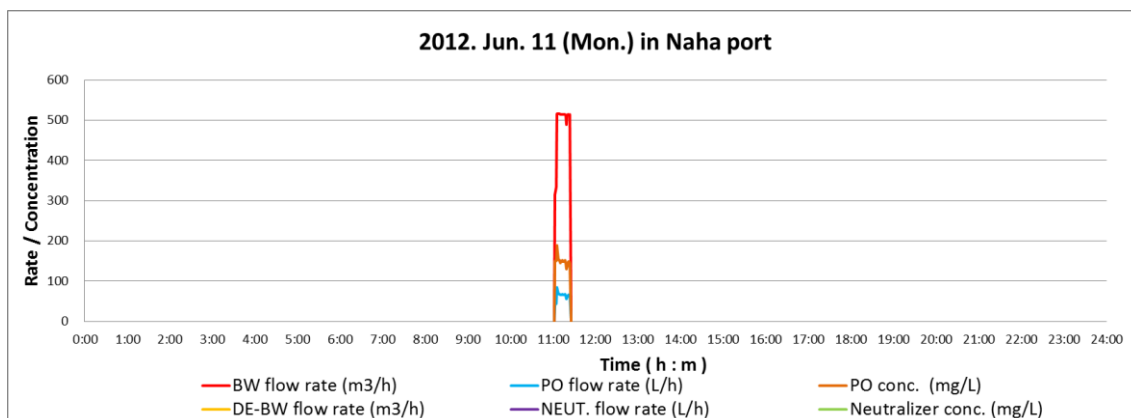


Figure 4-1-1(23) System operation data (2012/06/11)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

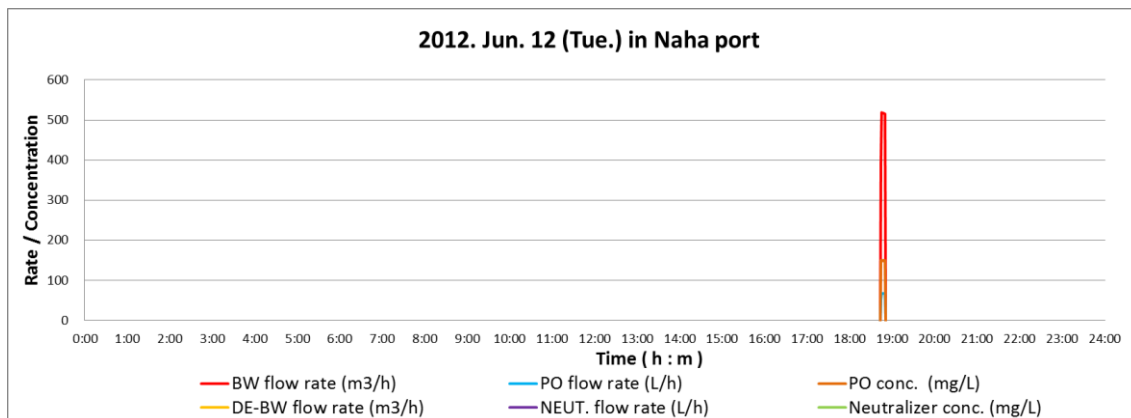


Figure 4-1-1(24) System operation data (2012/06/12)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

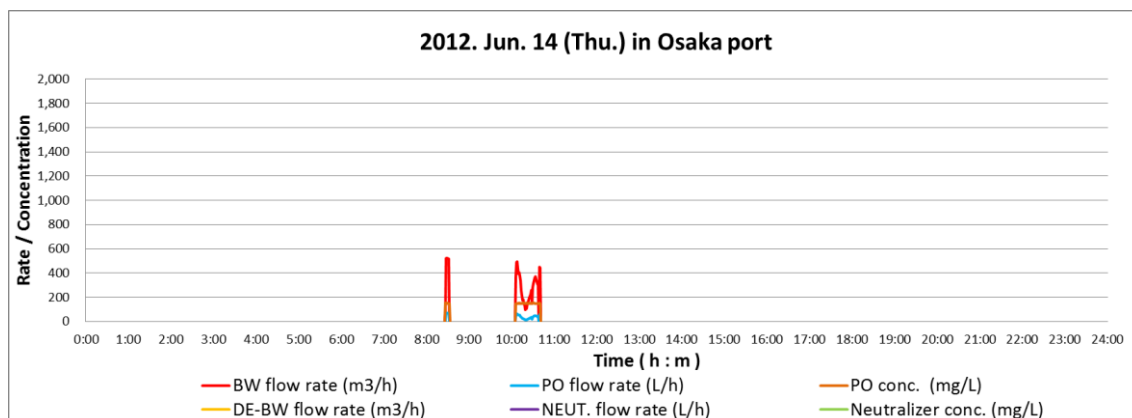


Figure 4-1-1(25) System operation data (2012/06/14)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

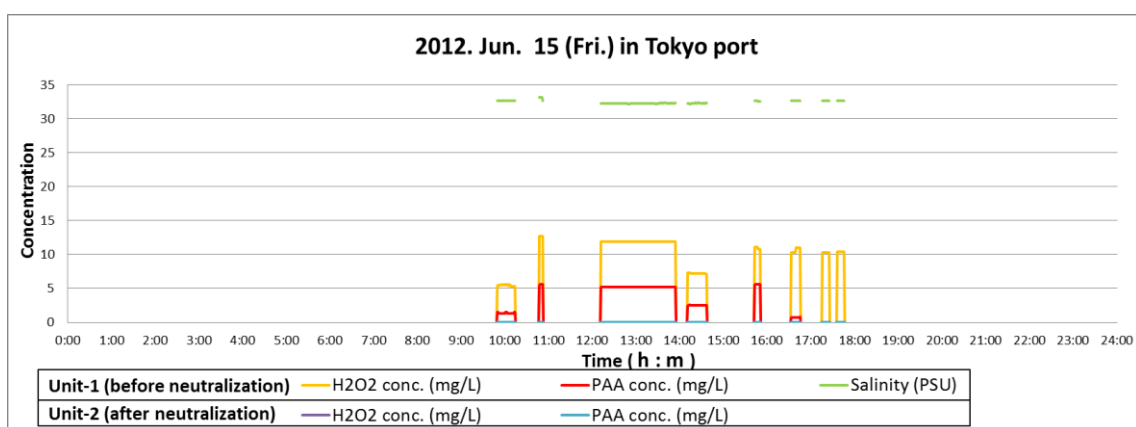
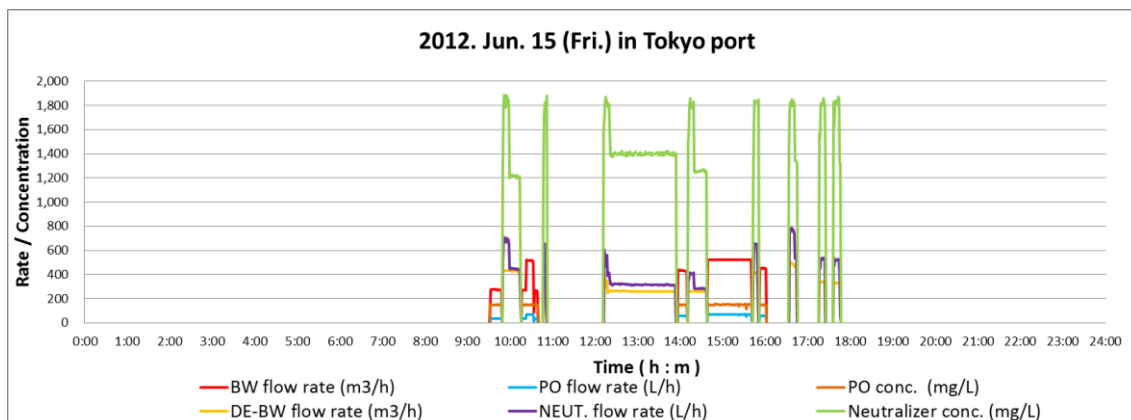


Figure 4-1-1(26) System operation data (2012/06/15)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

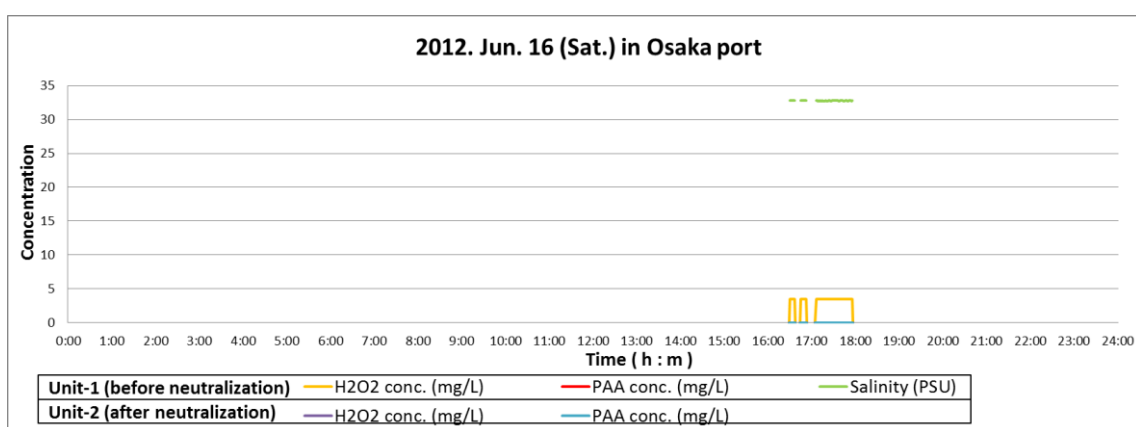
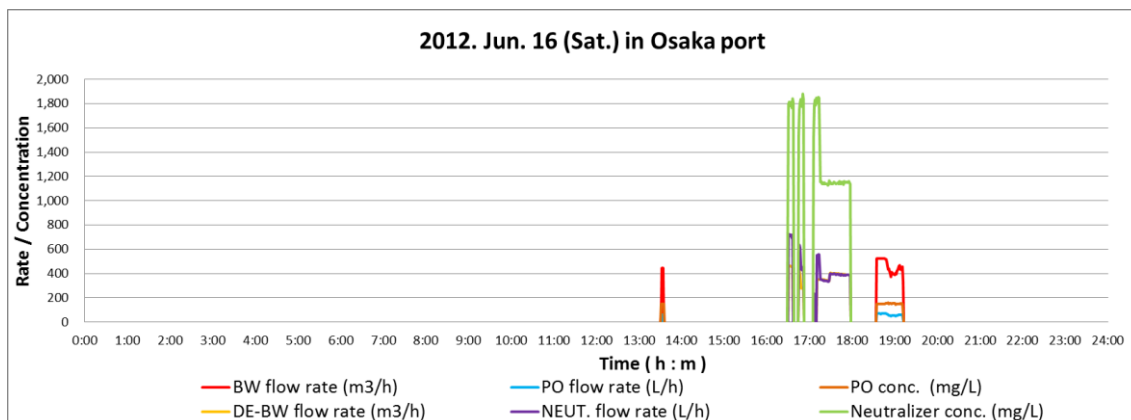


Figure 4-1-1(27) System operation data (2012/06/16)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

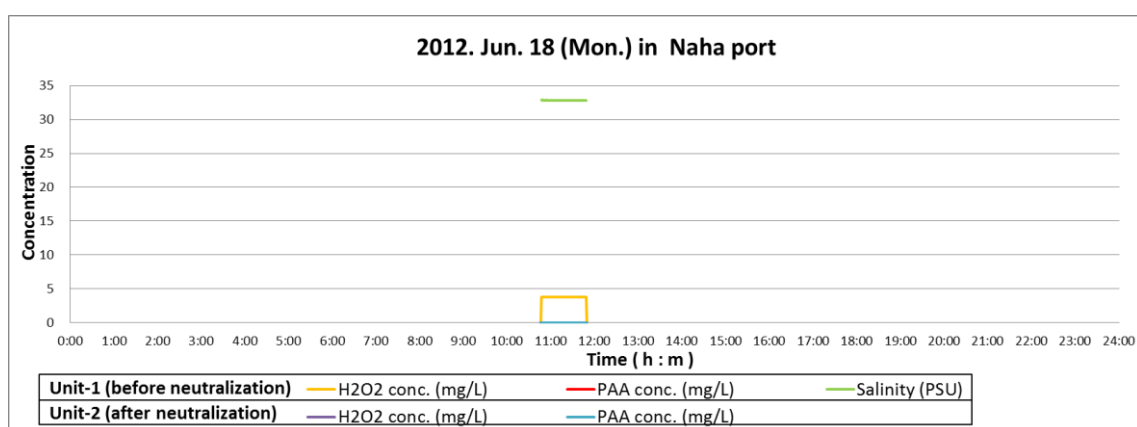
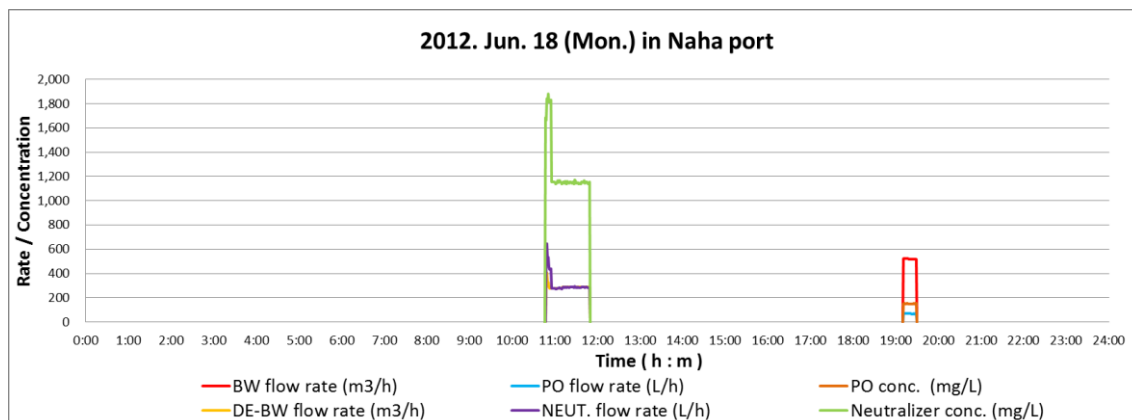


Figure 4-1-1(28) System operation data (2012/06/18)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

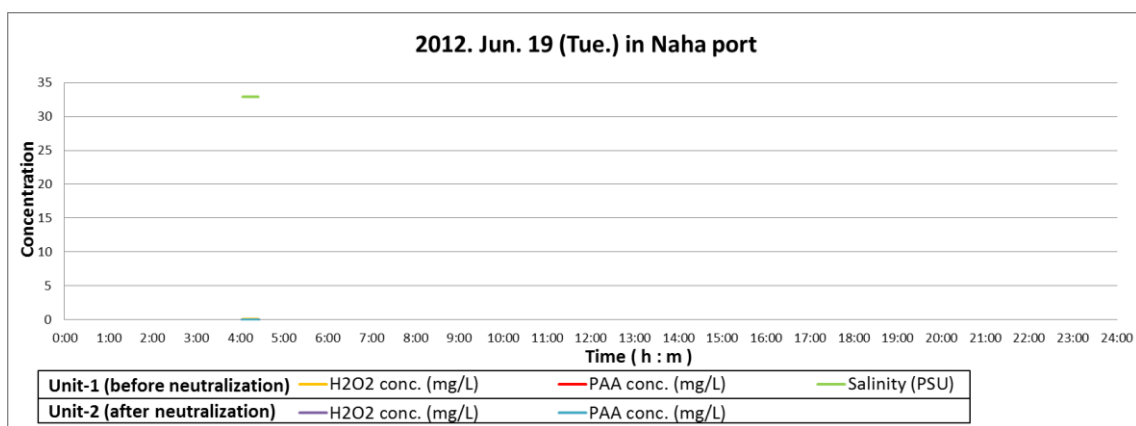
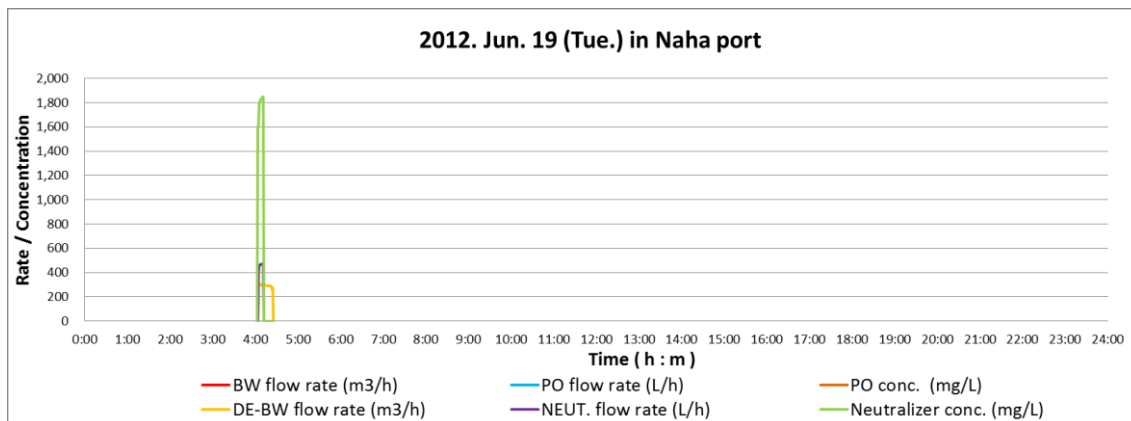


Figure 4-1-1(29) System operation data (2012/06/19)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

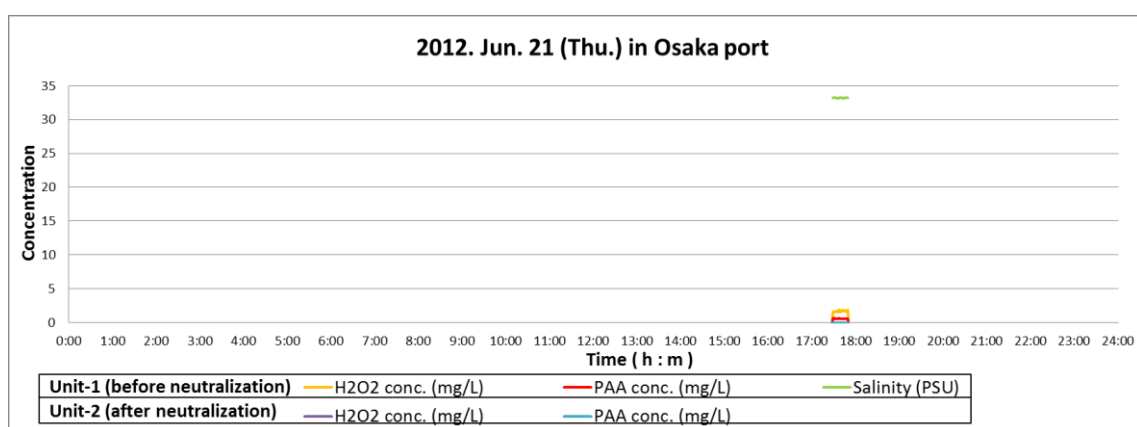
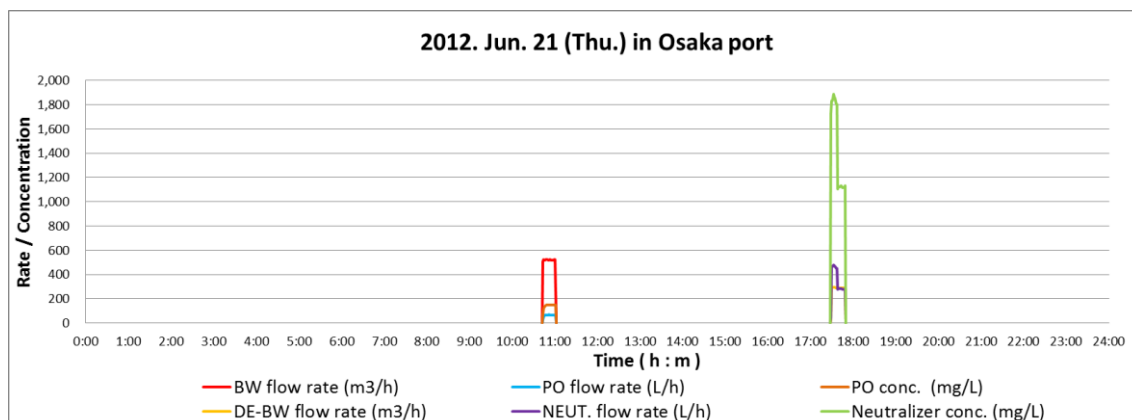


Figure 4-1-1(30) System operation data (2012/06/21)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

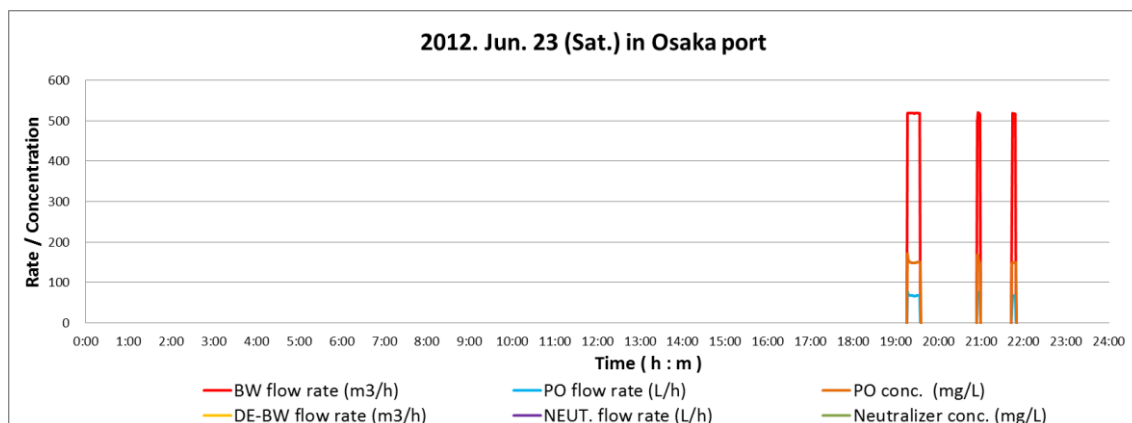


Figure 4-1-1(31) System operation data (2012/06/23)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

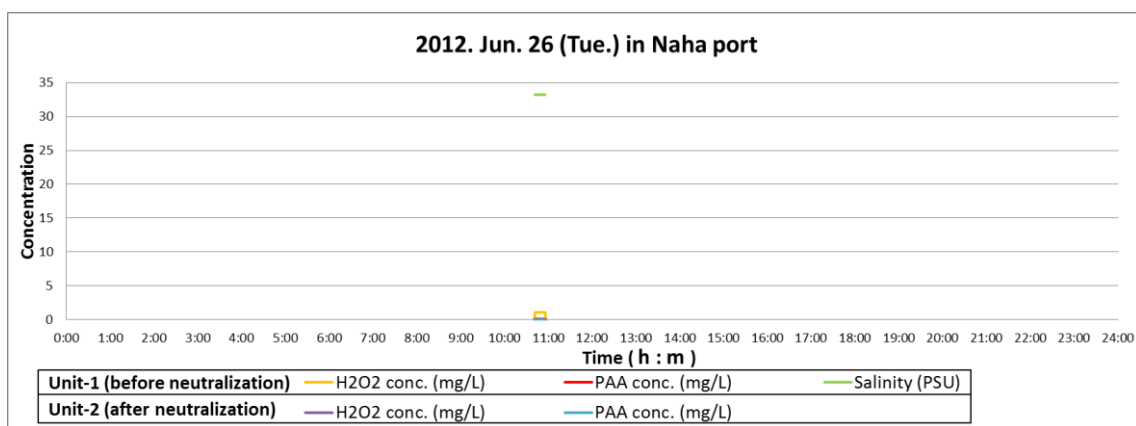
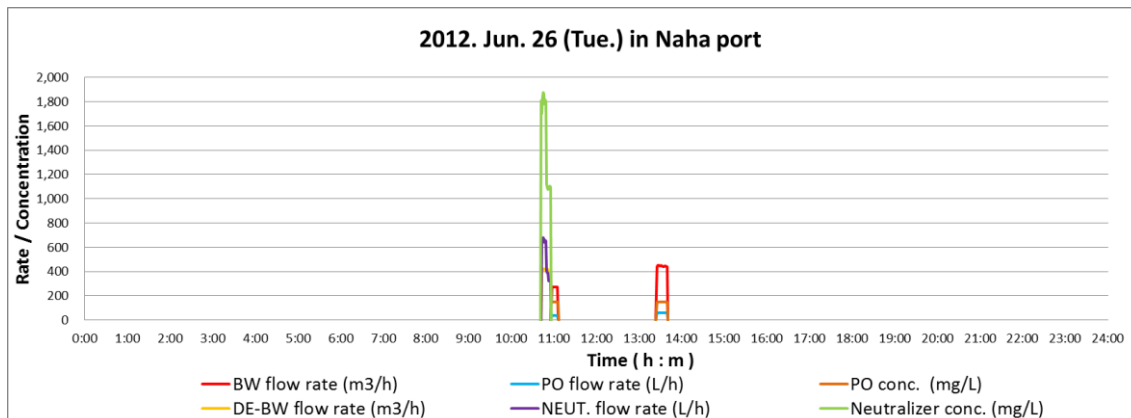


Figure 4-1-1(32) System operation data (2012/06/26)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

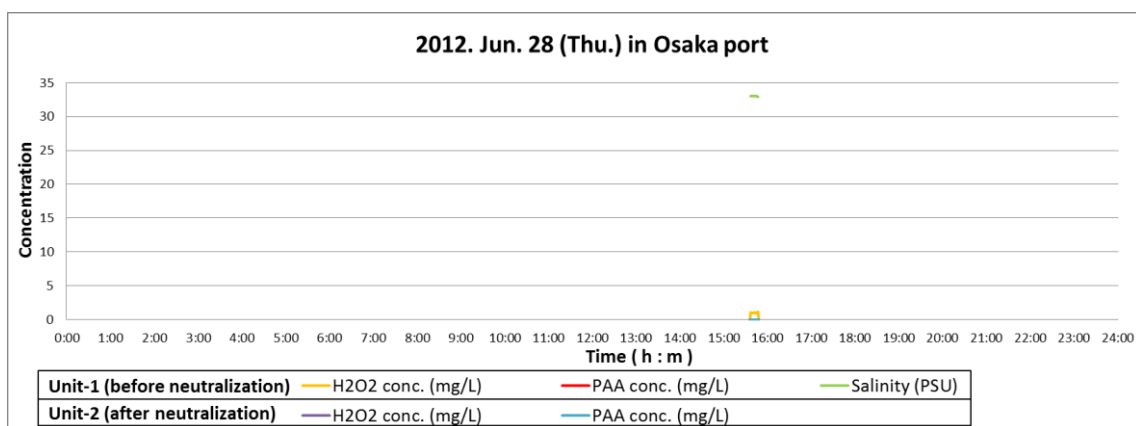
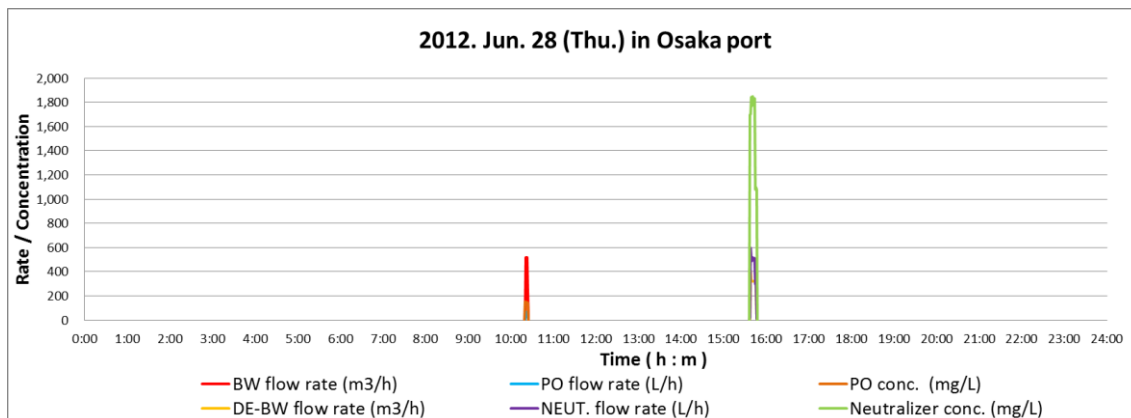


Figure 4-1-1(33) System operation data (2012/06/28)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

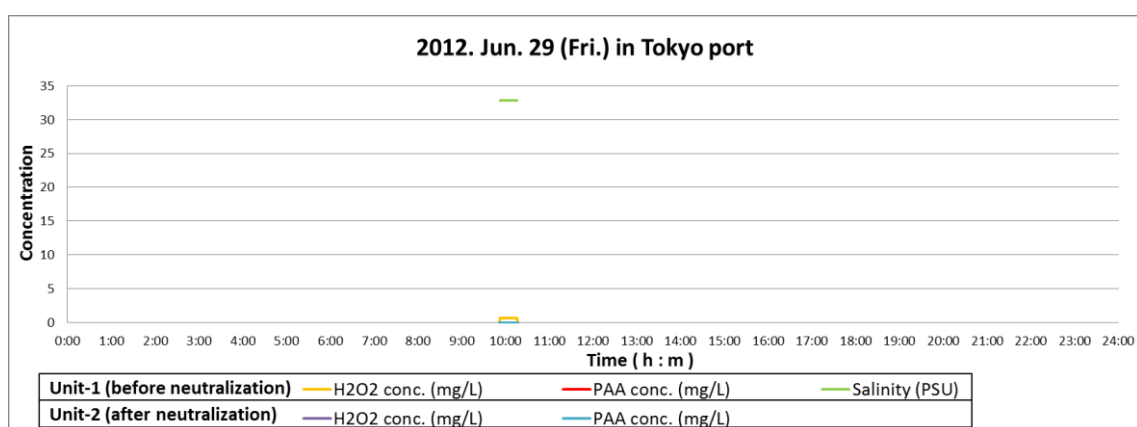
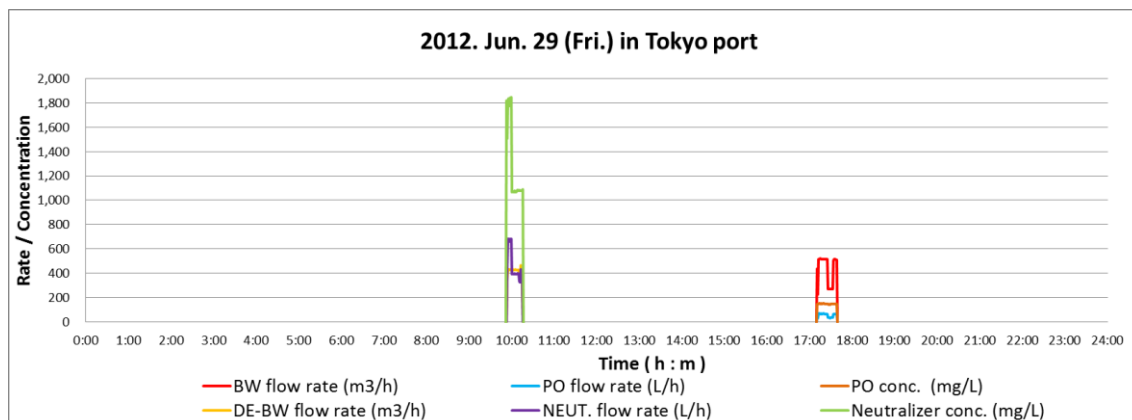


Figure 4-1-1(34) System operation data (2012/06/29)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

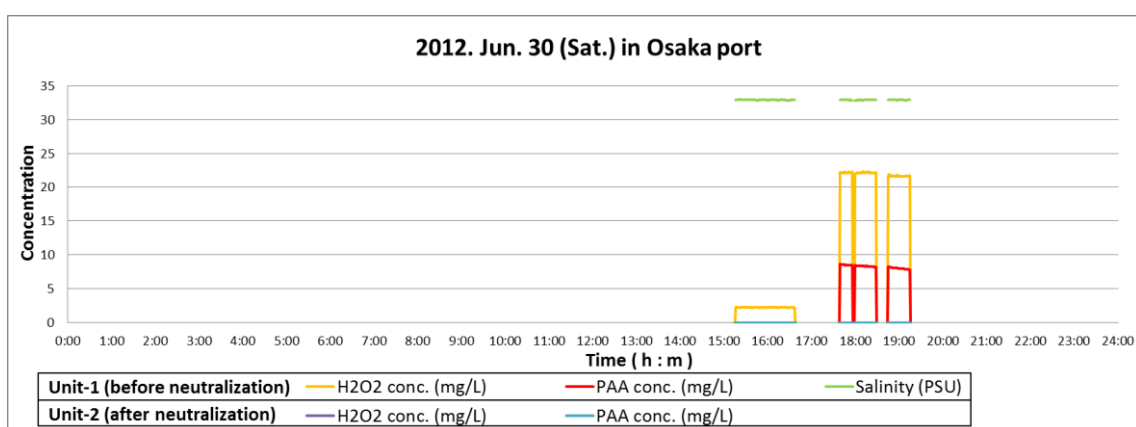
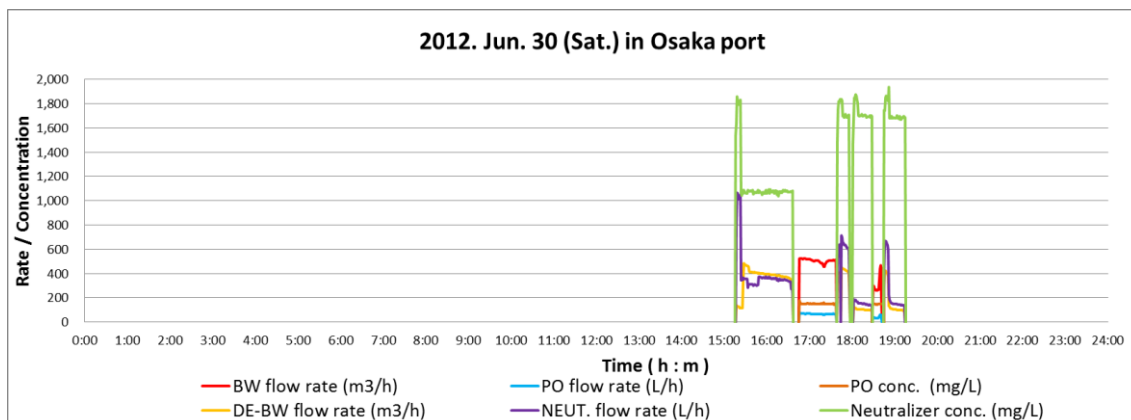


Figure 4-1-1(35) System operation data (2012/06/30)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

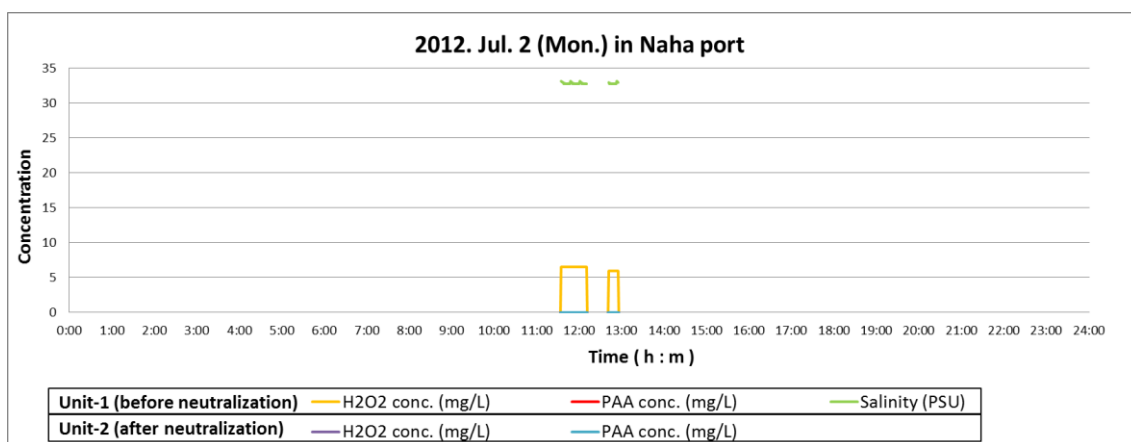
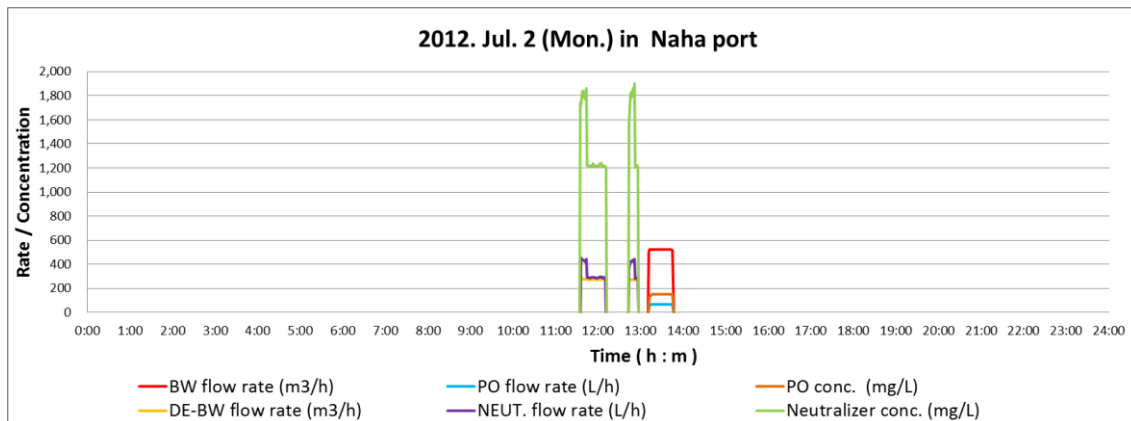


Figure 4-1-1(36) System operation data (2012/07/2)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

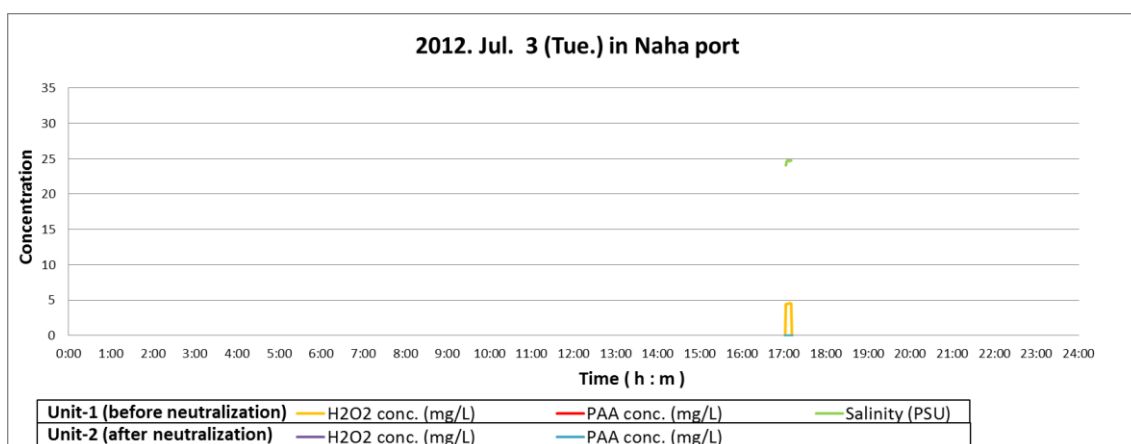
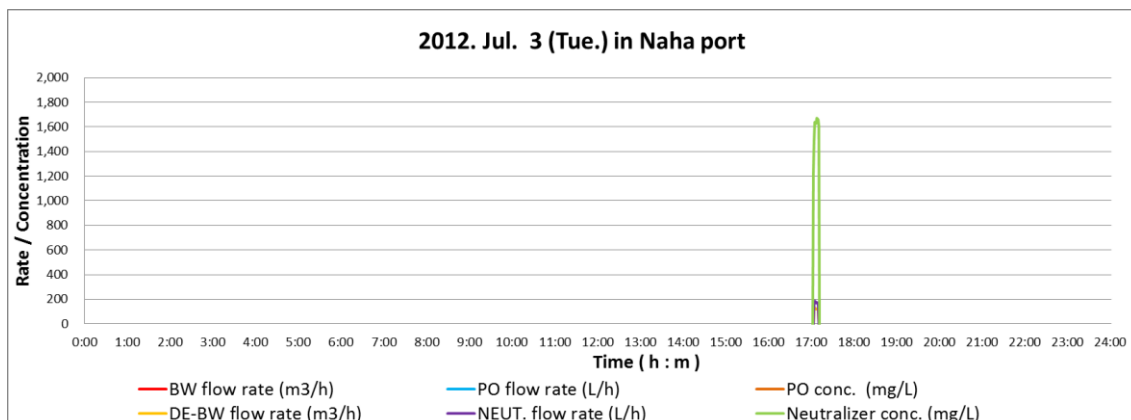


Figure 4-1-1(37) System operation data (2012/07/3)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

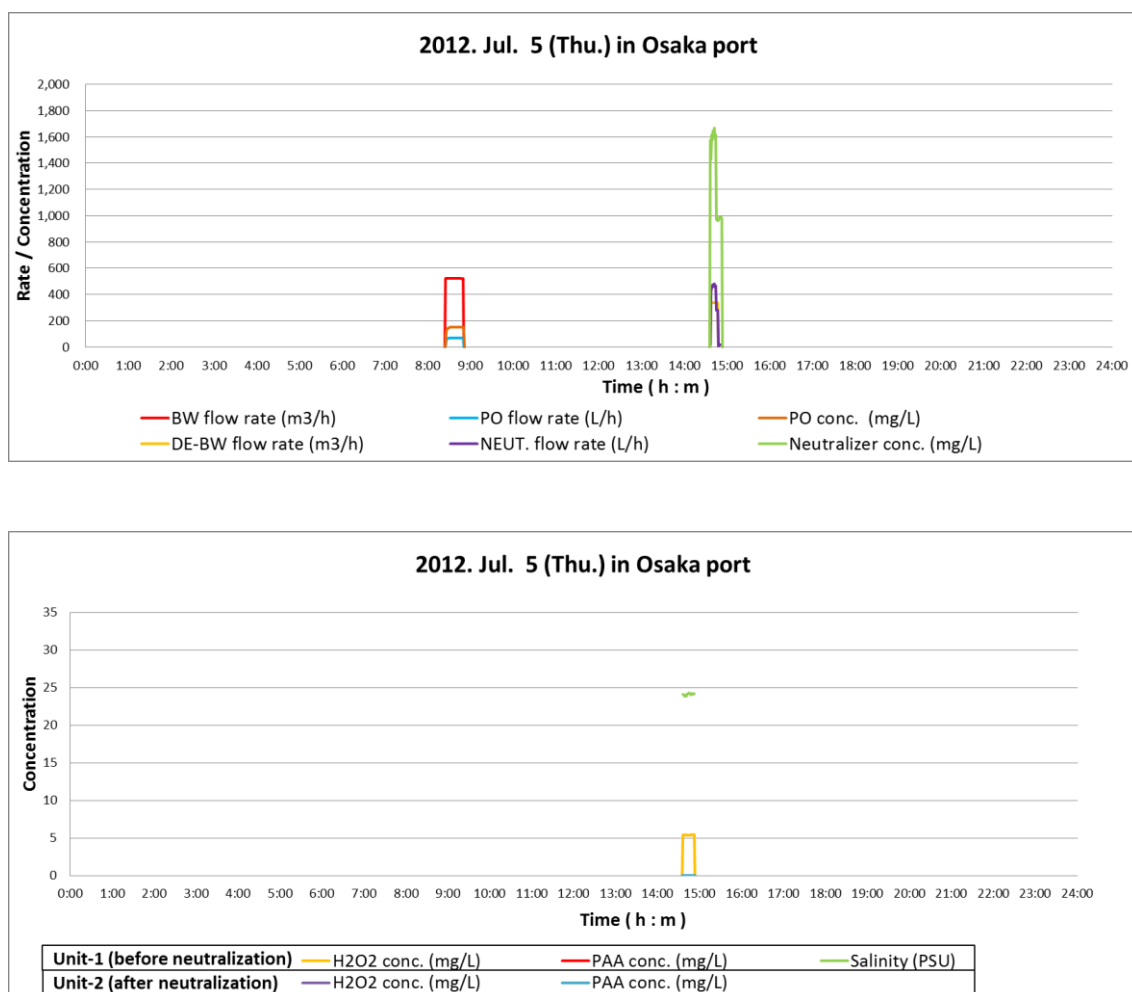


Figure 4-1-1(38) System operation data (2012/07/5)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

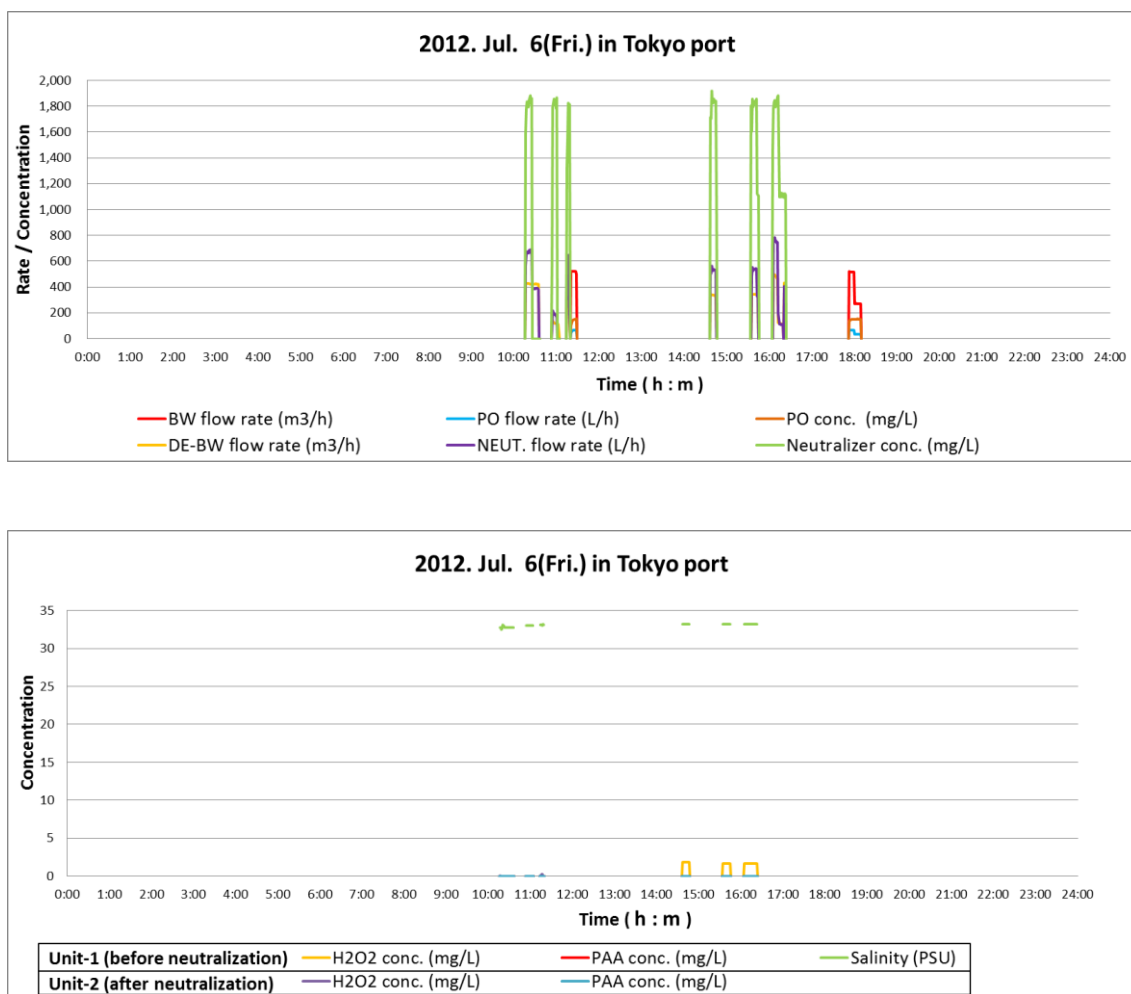


Figure 4-1-1(39) System operation data (2012/07/6)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

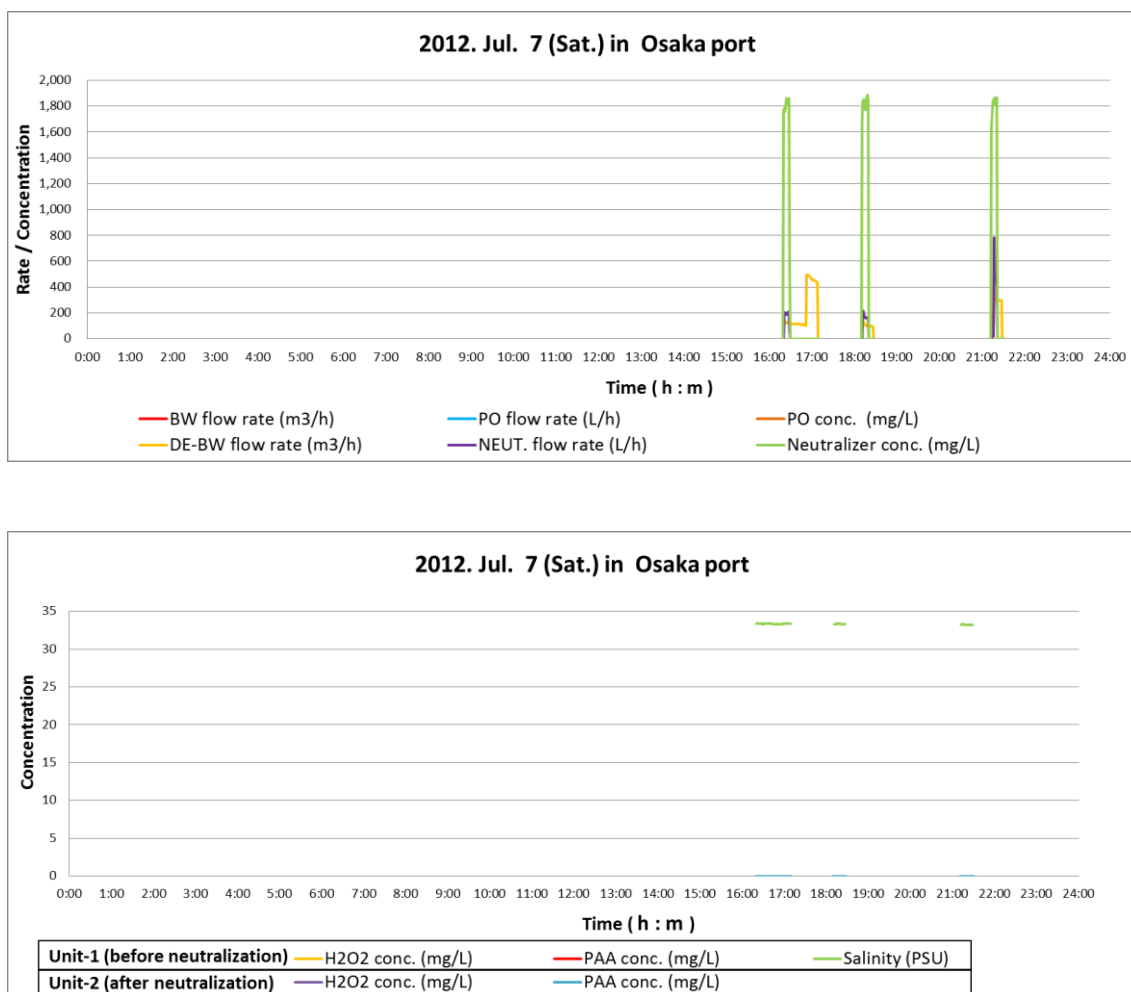


Figure 4-1-1(40) System operation data (2012/07/7)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

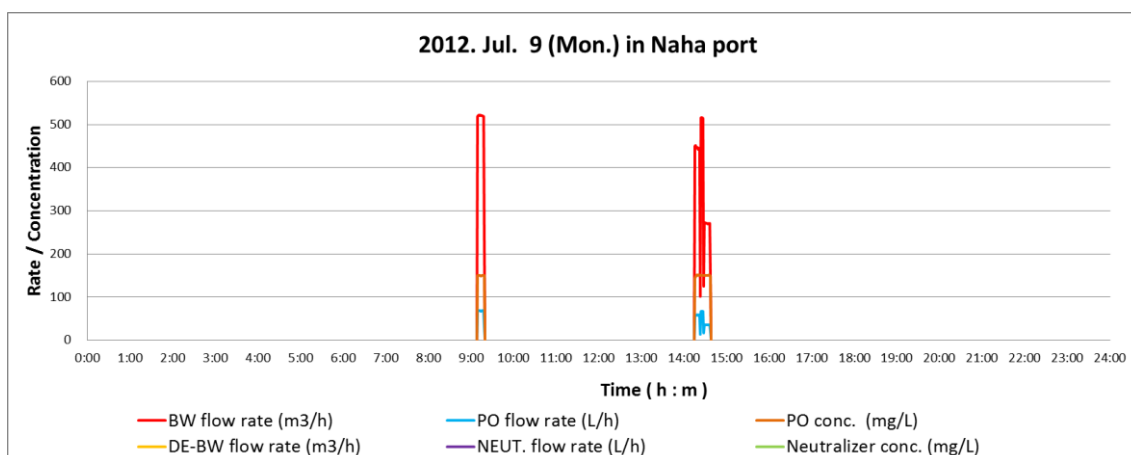


Figure 4-1-1(41) System operation data (2012/07/9)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

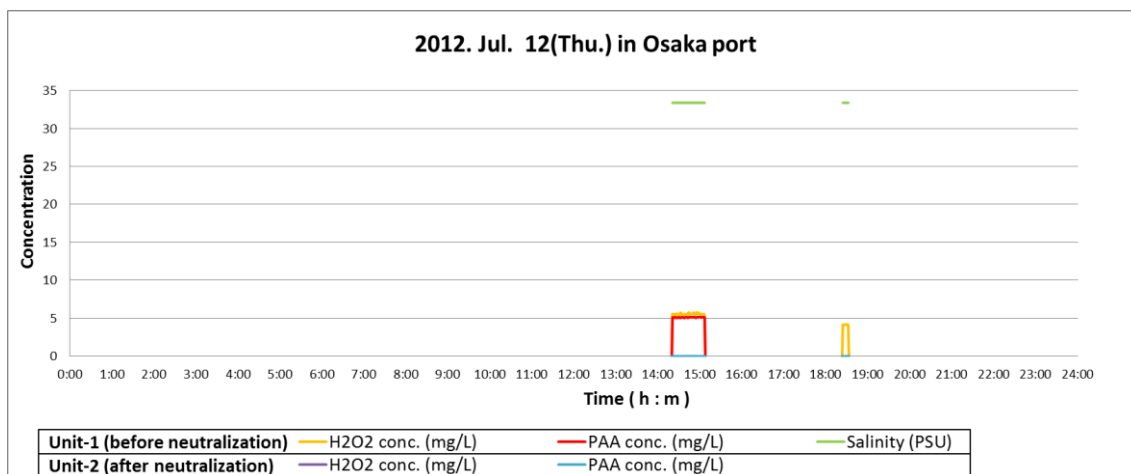
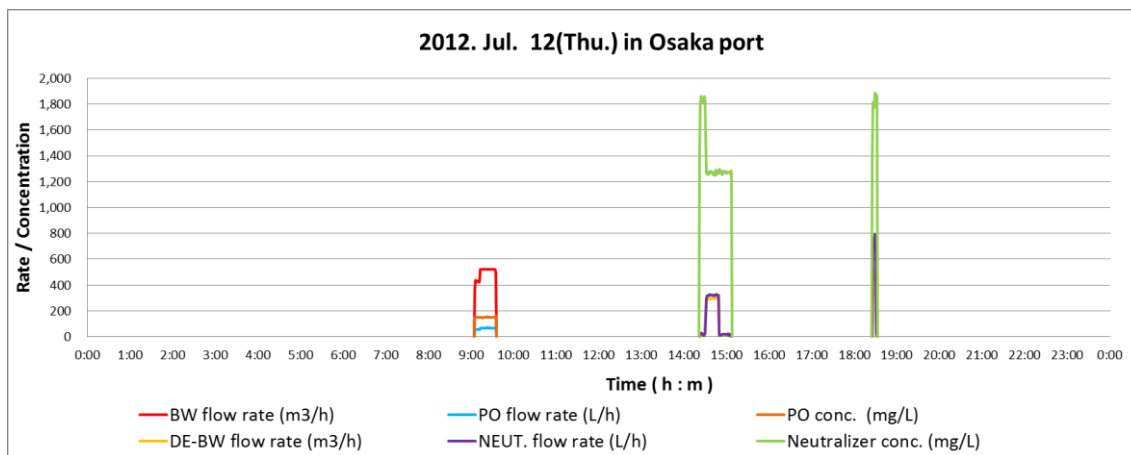


Figure 4-1-1(42) System operation data (2012/07/12)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

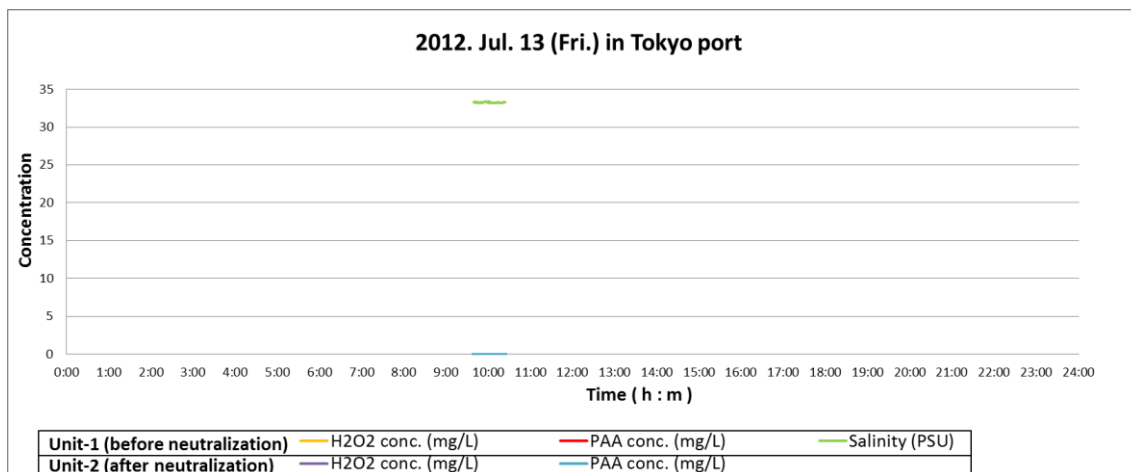
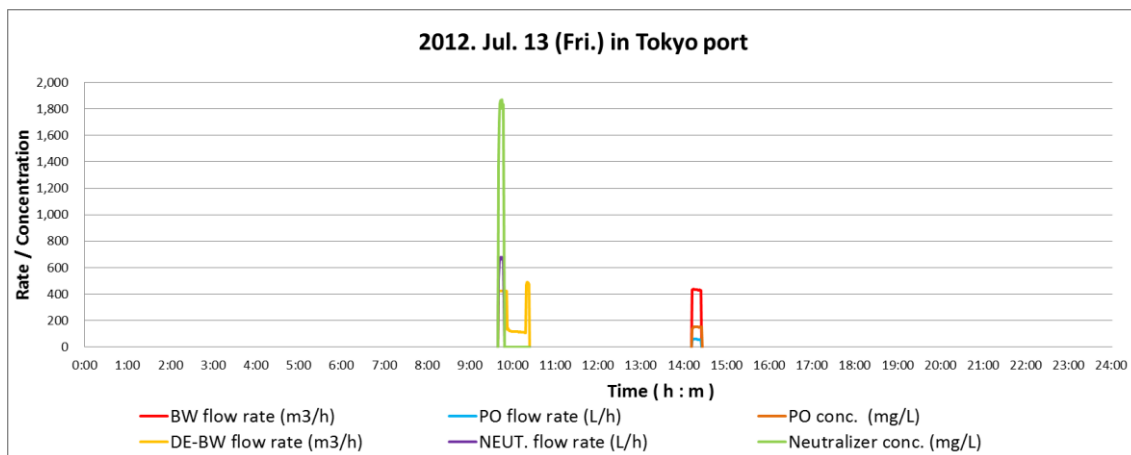


Figure 4-1-1(43) System operation data (2012/07/13)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

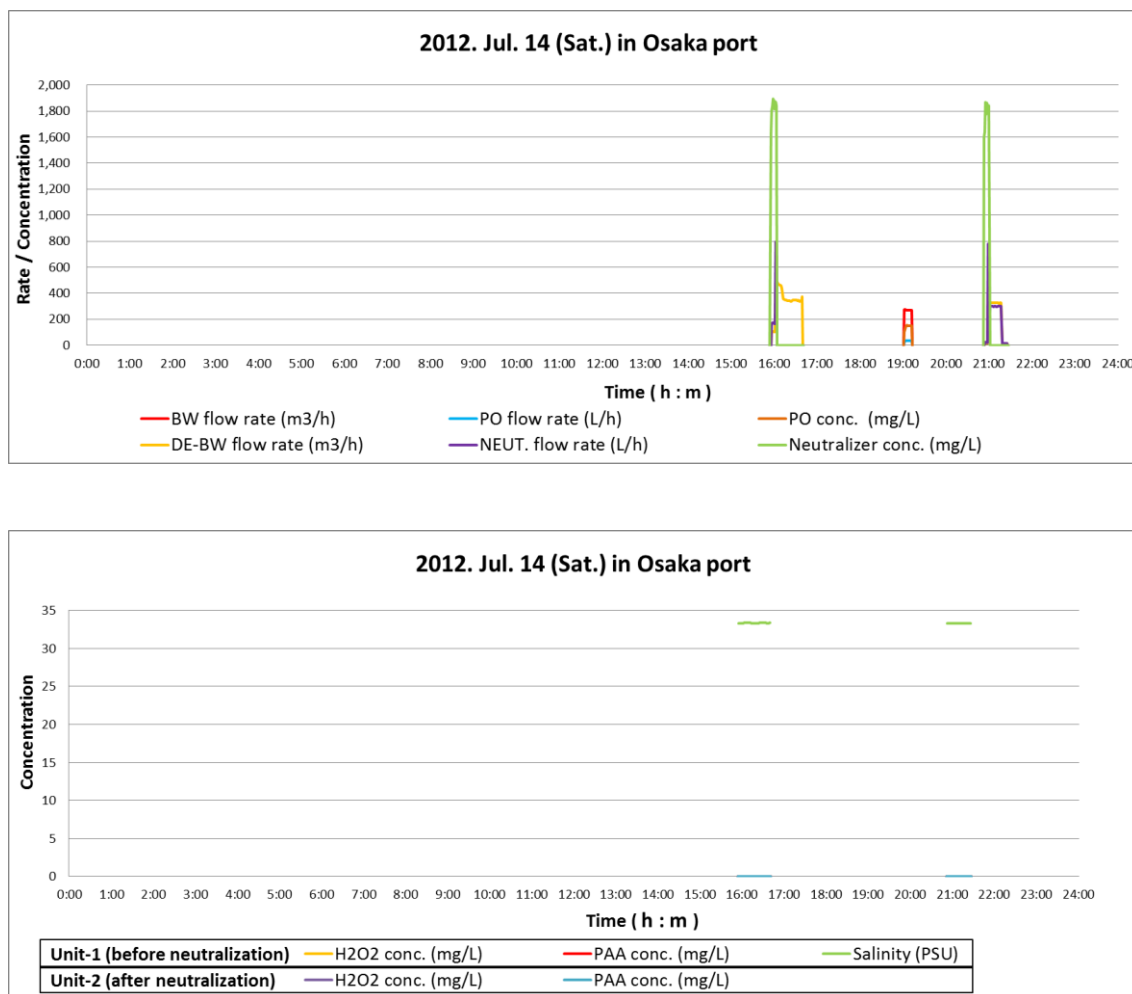


Figure 4-1-1(44) System operation data (2012/07/14)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

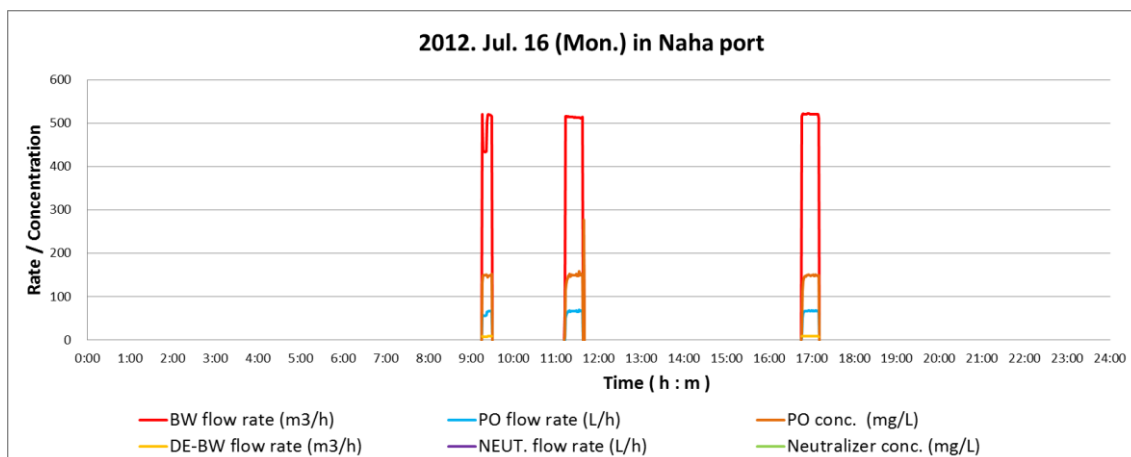
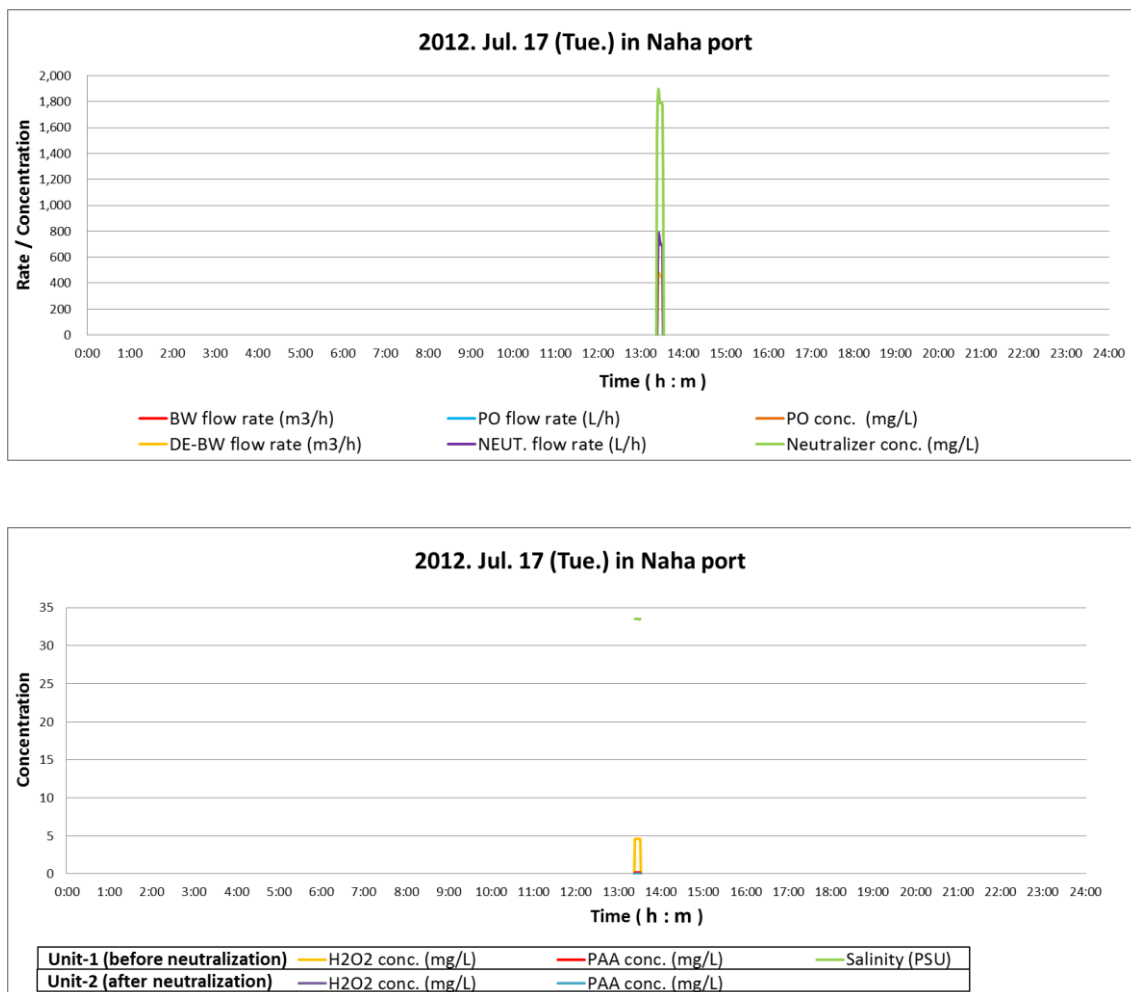


Figure 4-1-1(45) System operation data (2012/07/16)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.



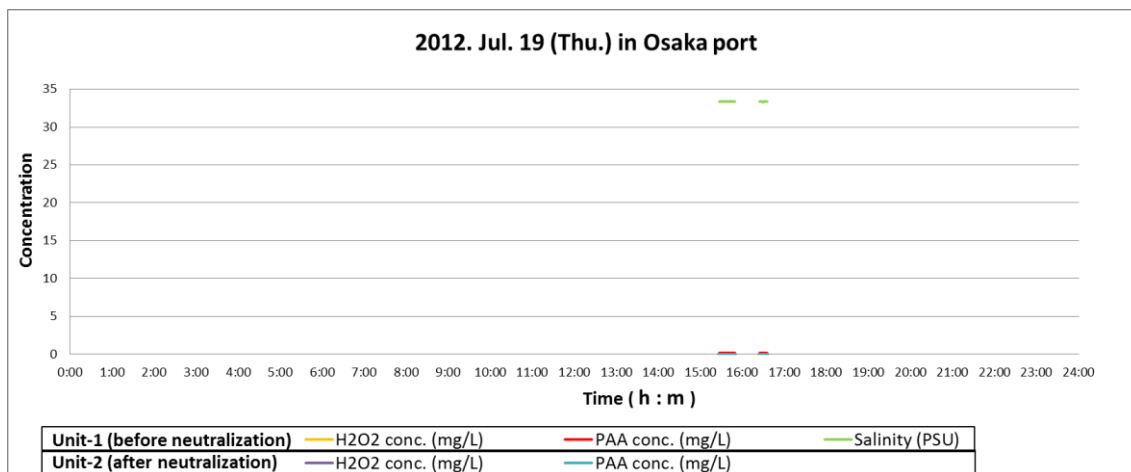
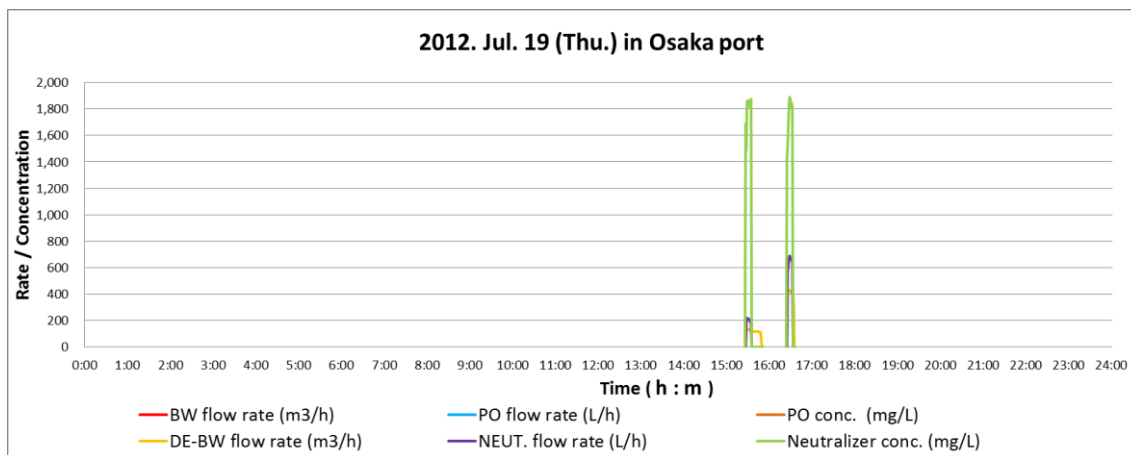


Figure 4-1-1(47) System operation data (2012/07/19)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

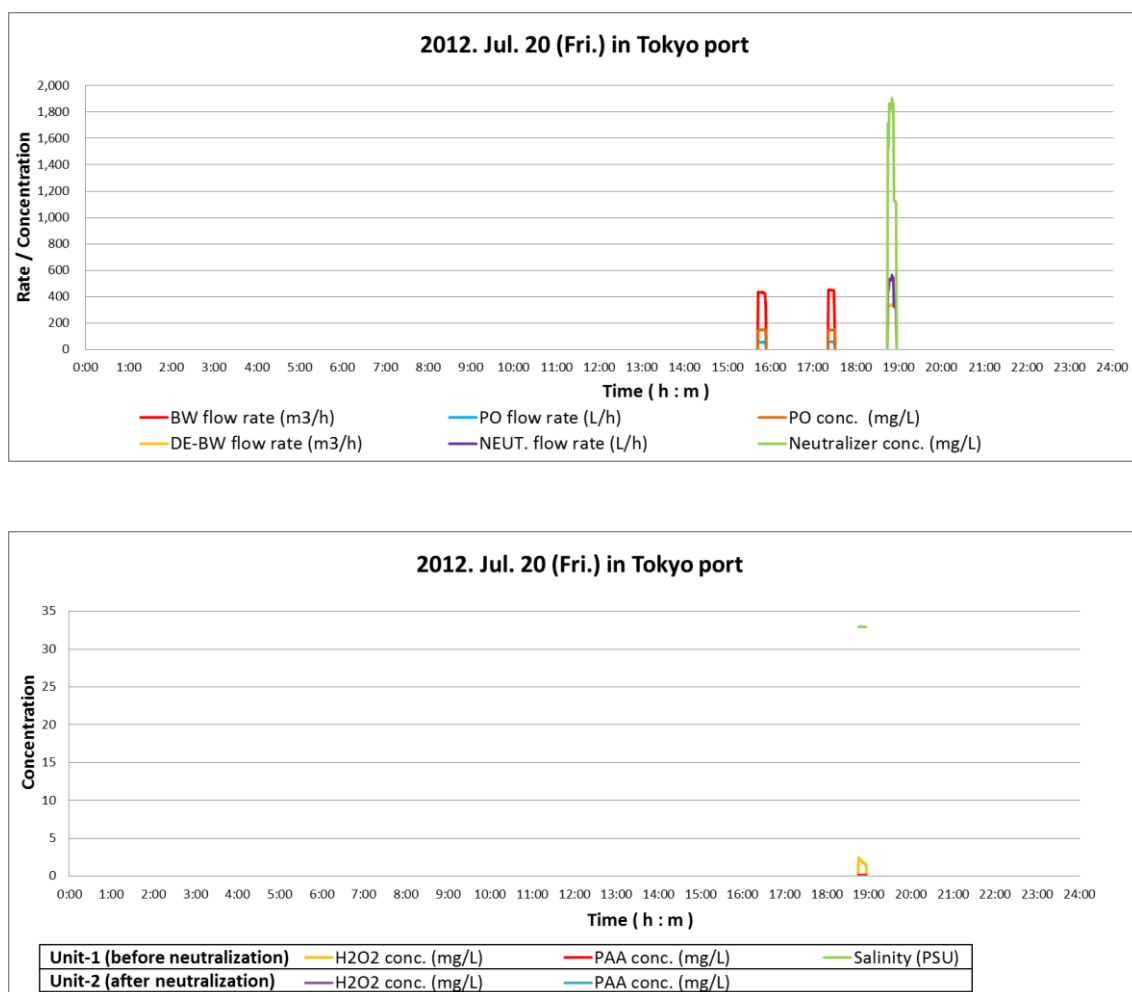


Figure 4-1-1(48) System operation data (2012/07/20)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

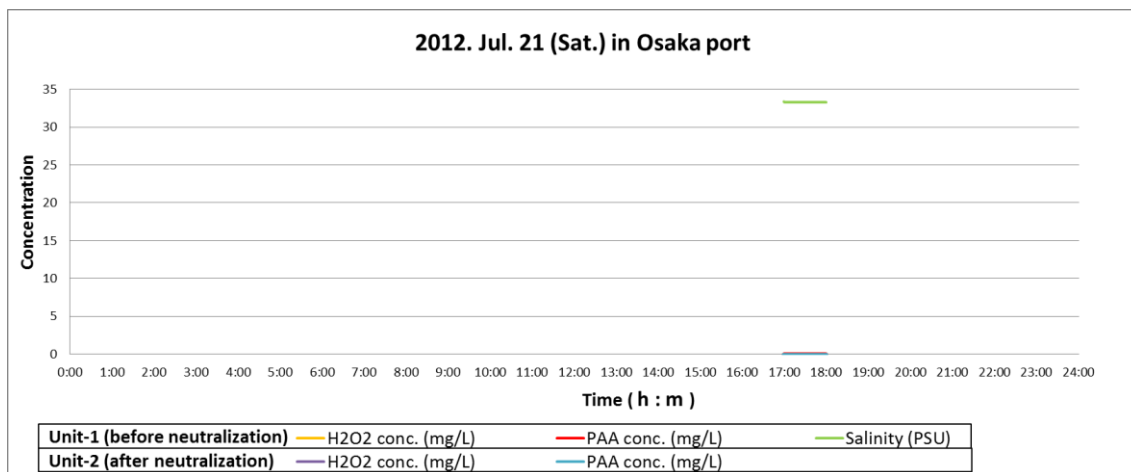
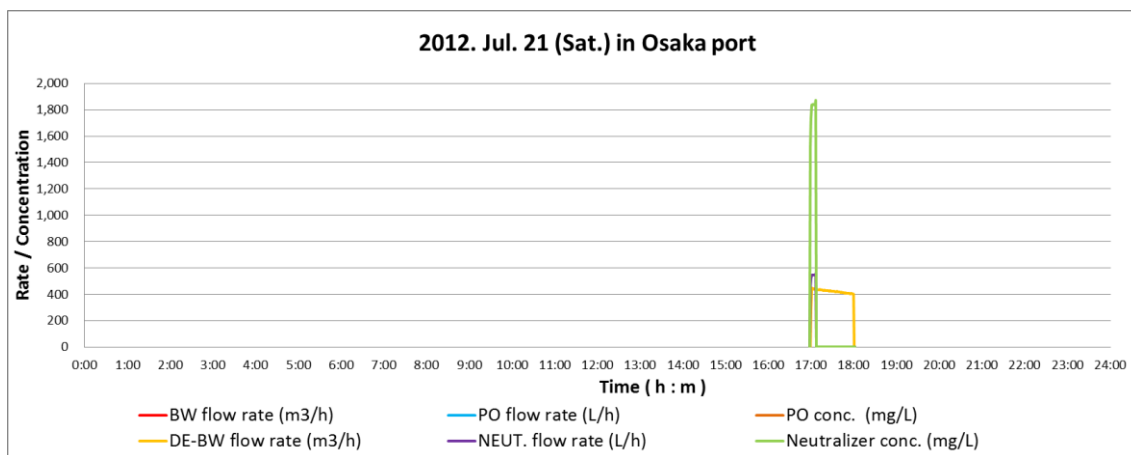


Figure 4-1-1(49) System operation data (2012/07/21)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

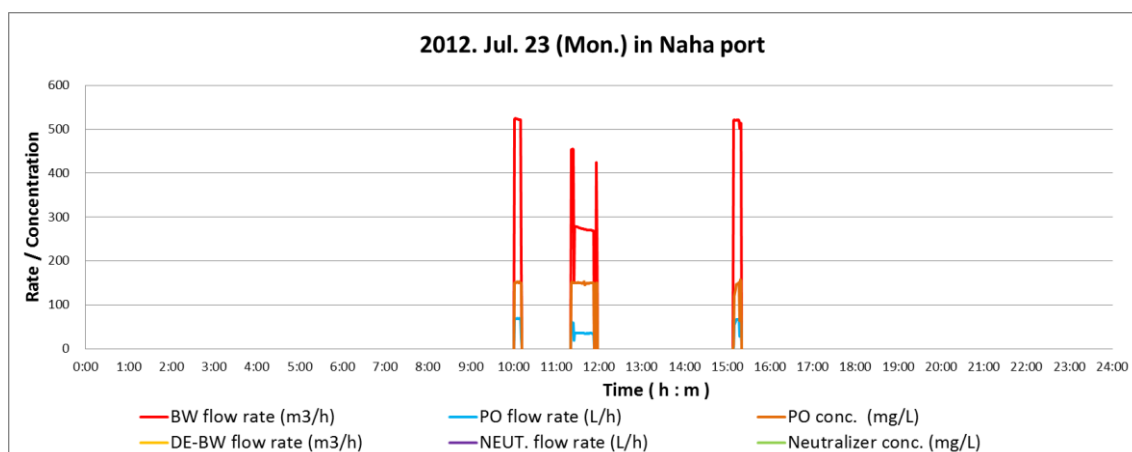


Figure 4-1-1(50) System operation data (2012/07/23)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

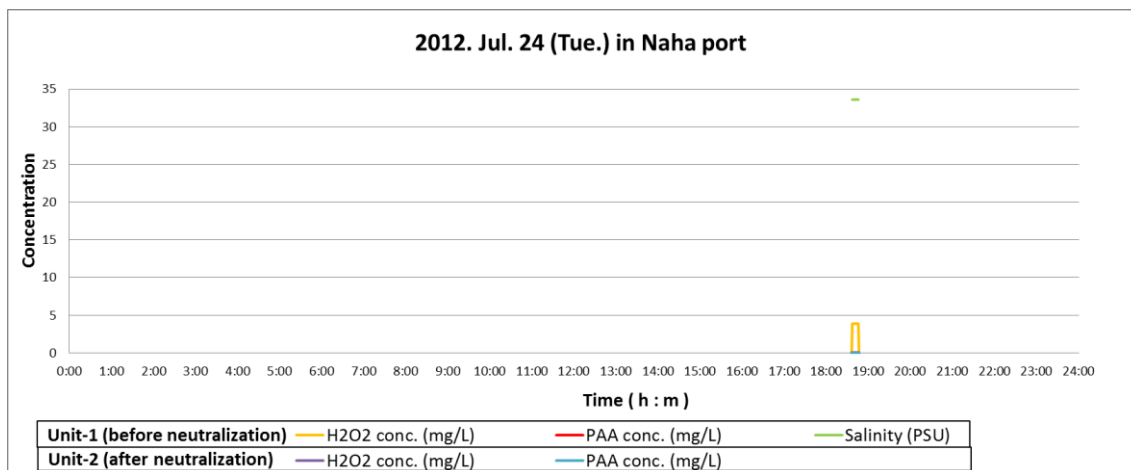
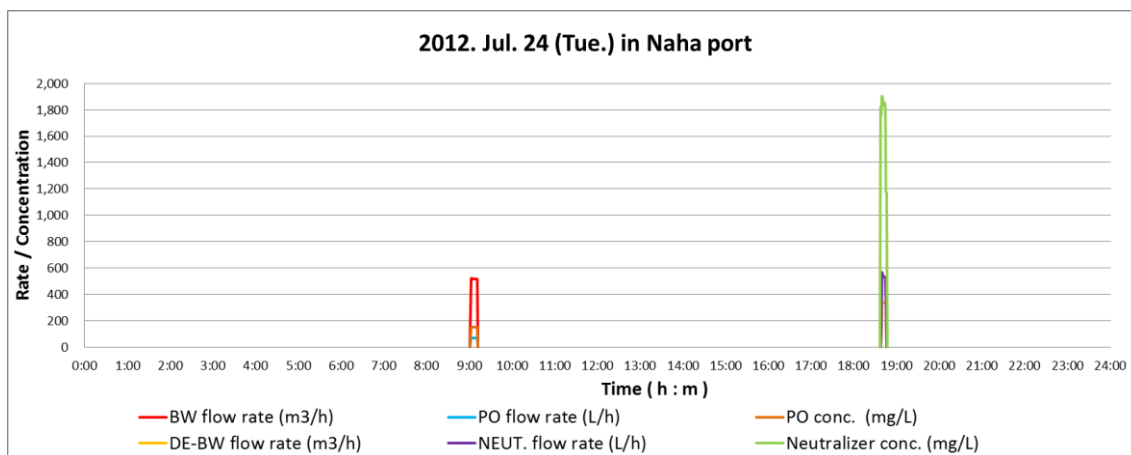


Figure 4-1-1(51) System operation data (2012/07/24)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

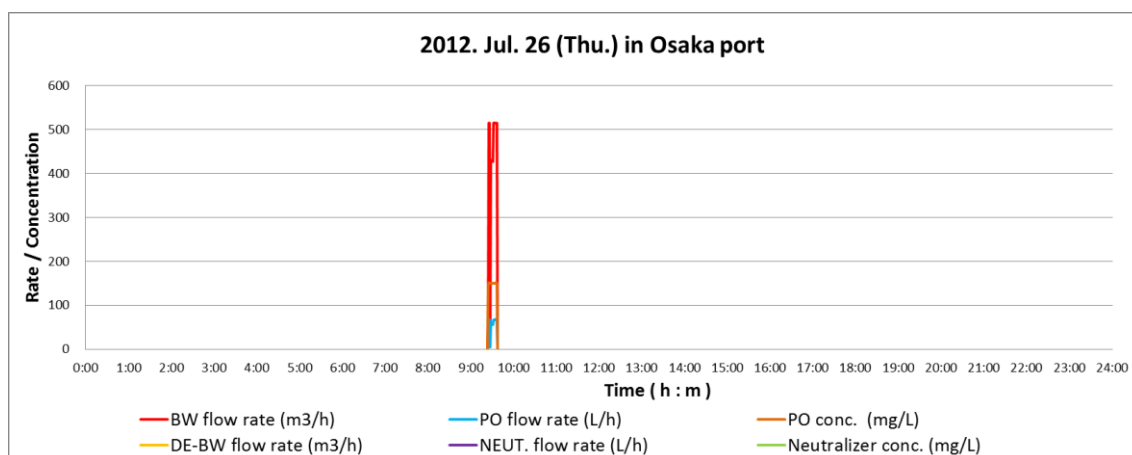


Figure 4-1-1(52) System operation data (2012/07/26)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

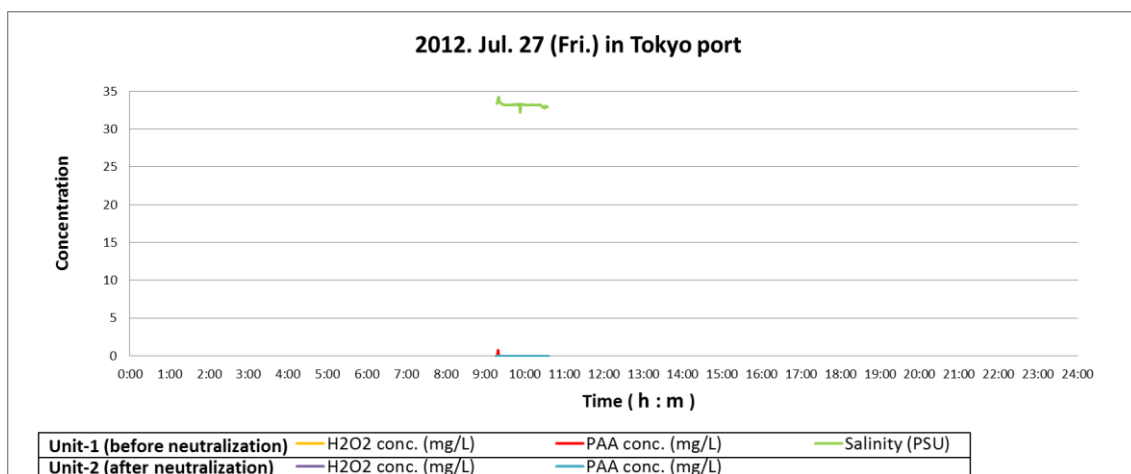
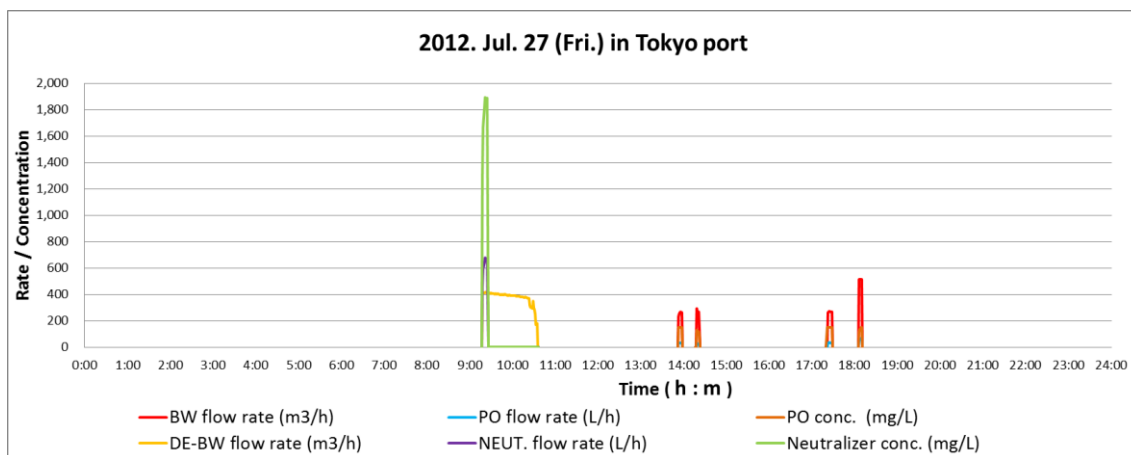


Figure 4-1-1(53) System operation data (2012/07/27)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

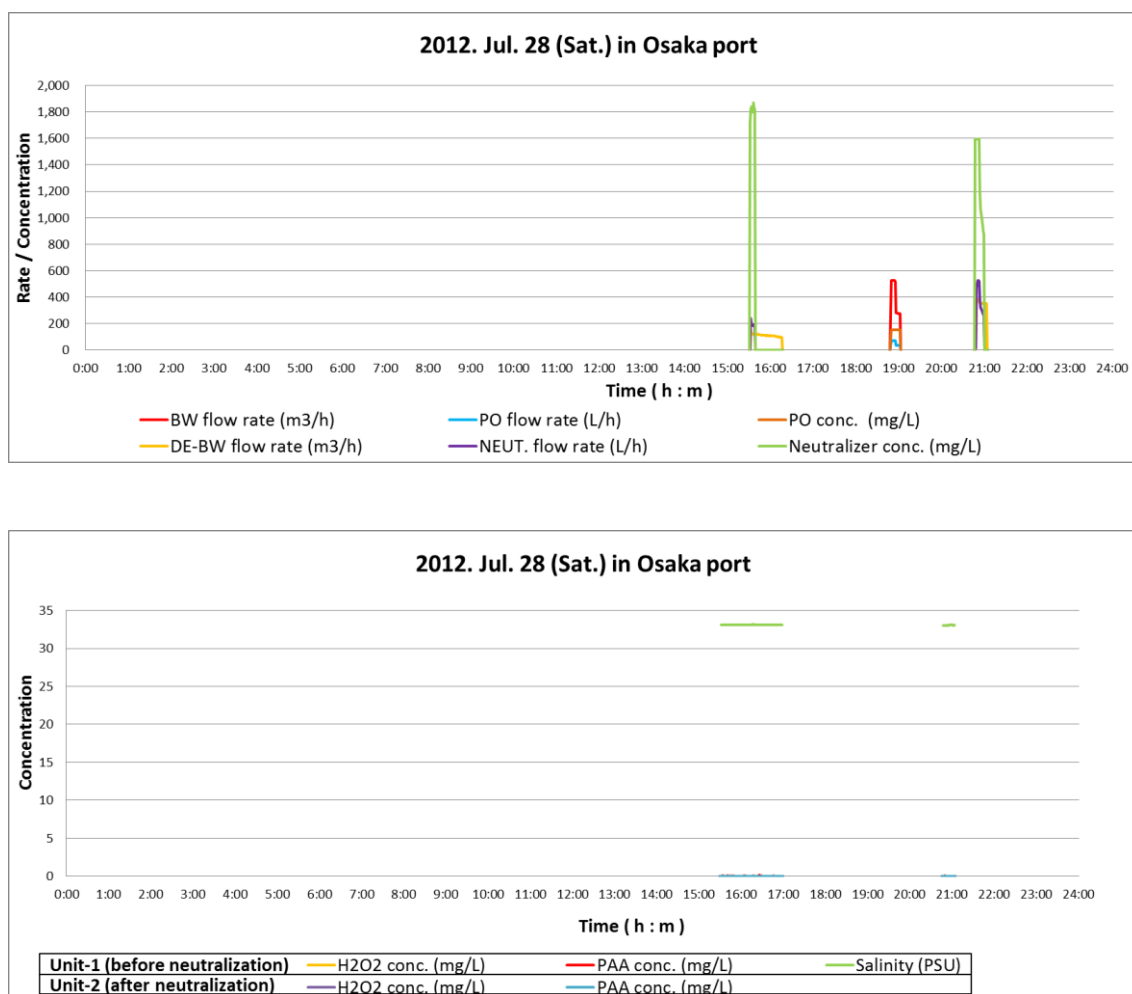


Figure 4-1-1(54) System operation data (2012/07/28)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

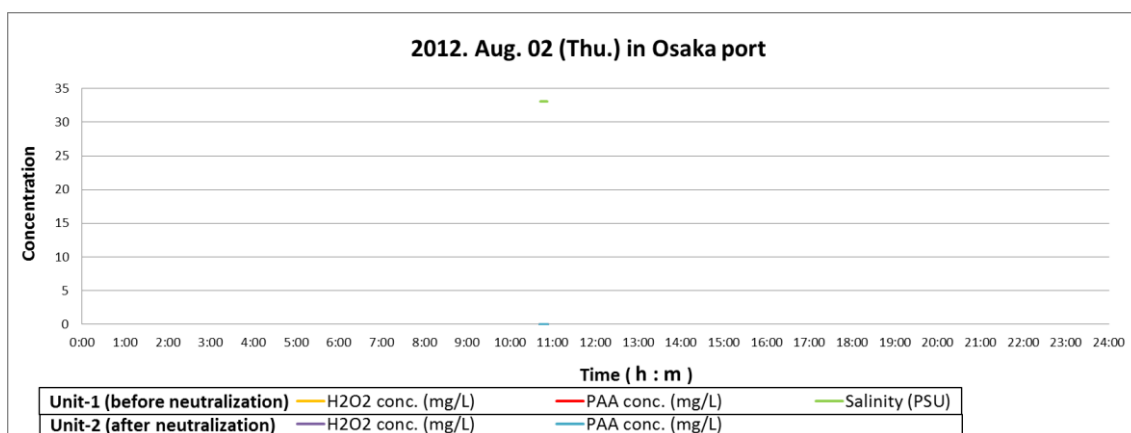
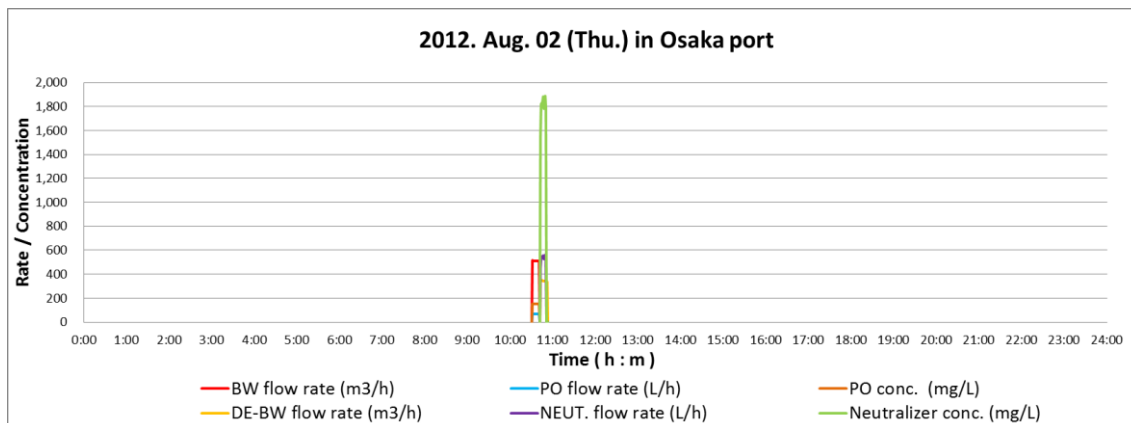


Figure 4-1-1(55) System operation data (2012/08/2)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

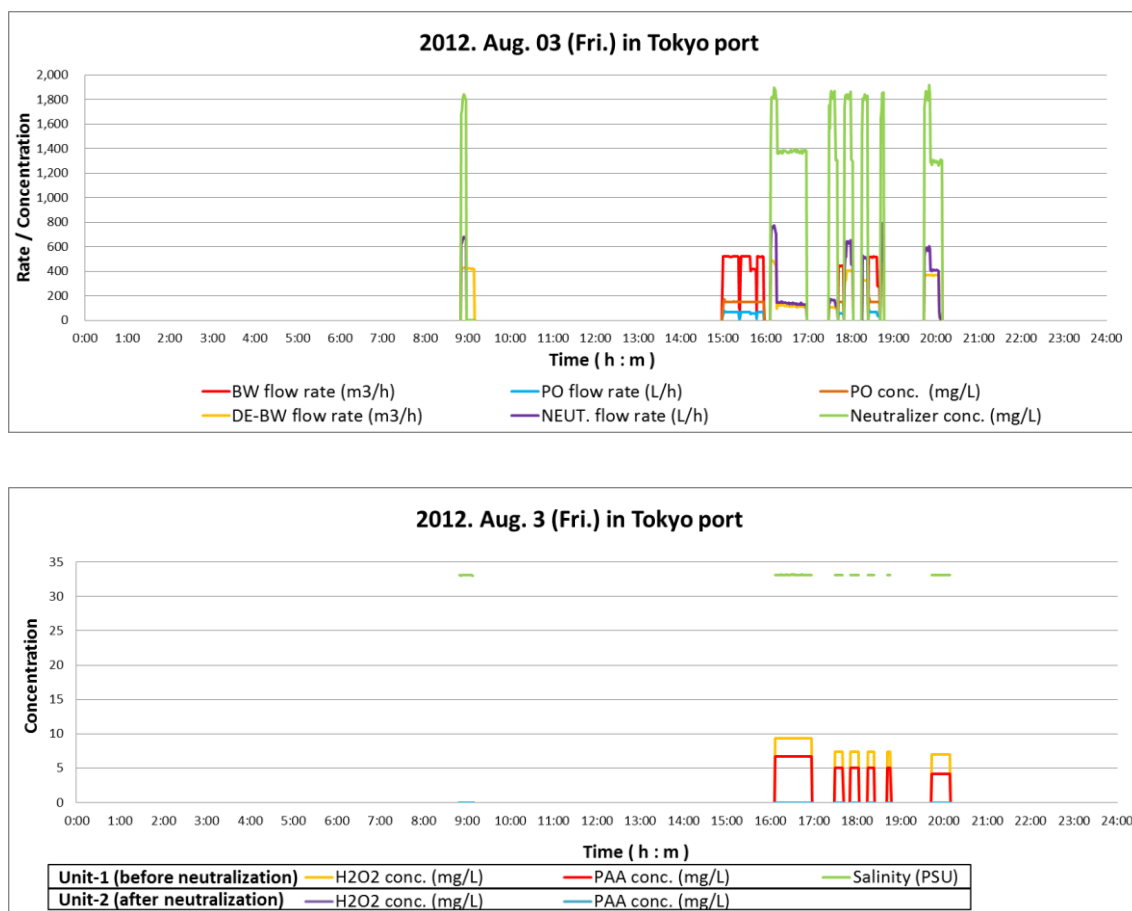


Figure 4-1-1(56) System operation data (2012/08/3)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

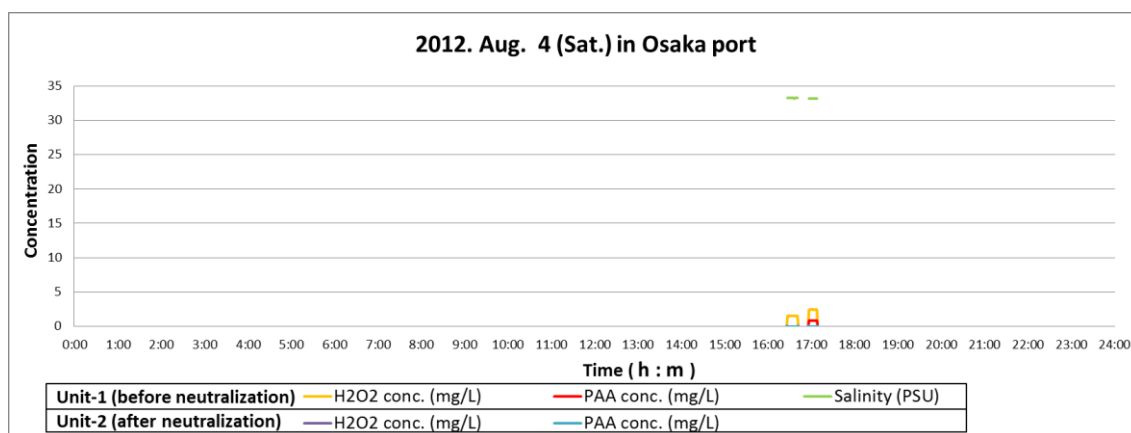
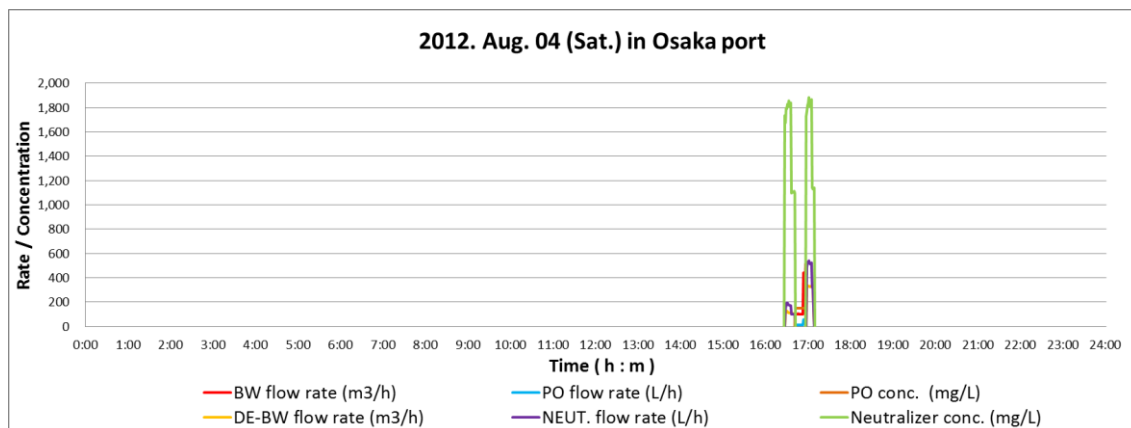


Figure 4-1-1(57) System operation data (2012/08/4)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

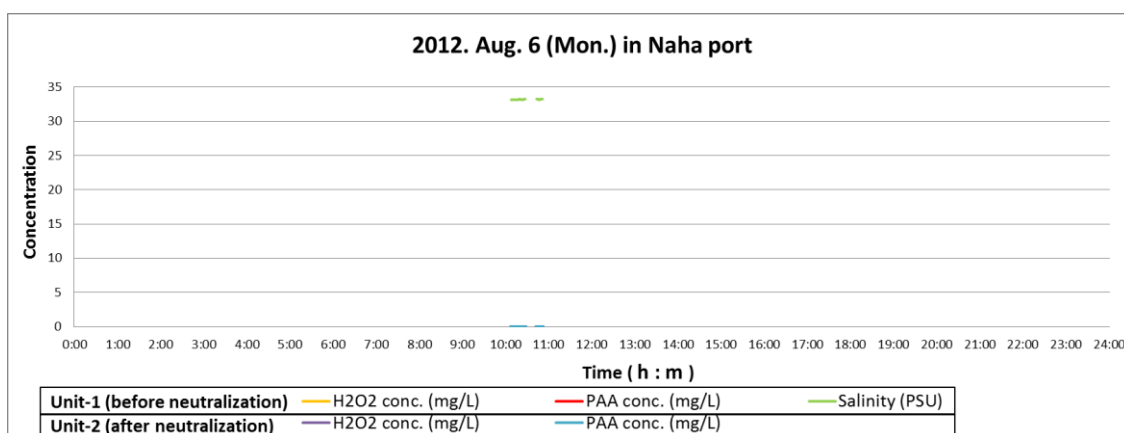
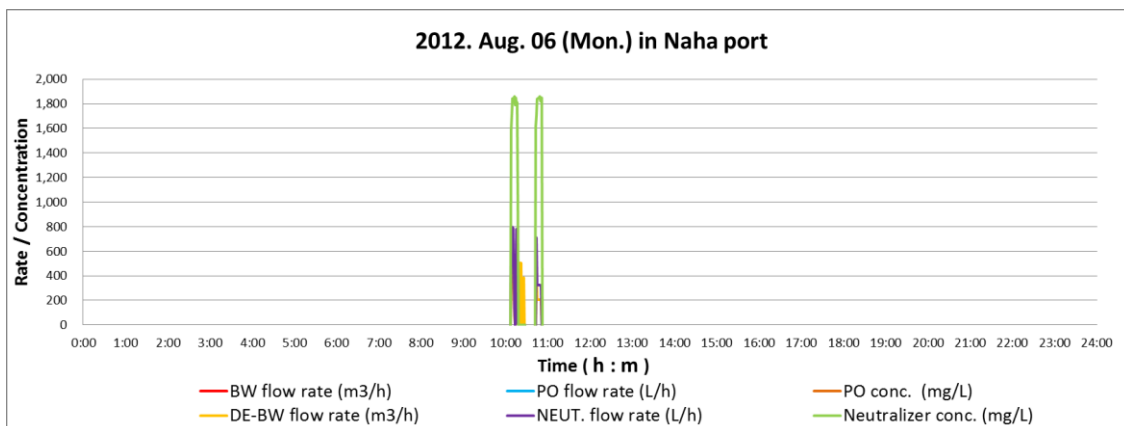


Figure 4-1-1(58) System operation data (2012/08/6)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

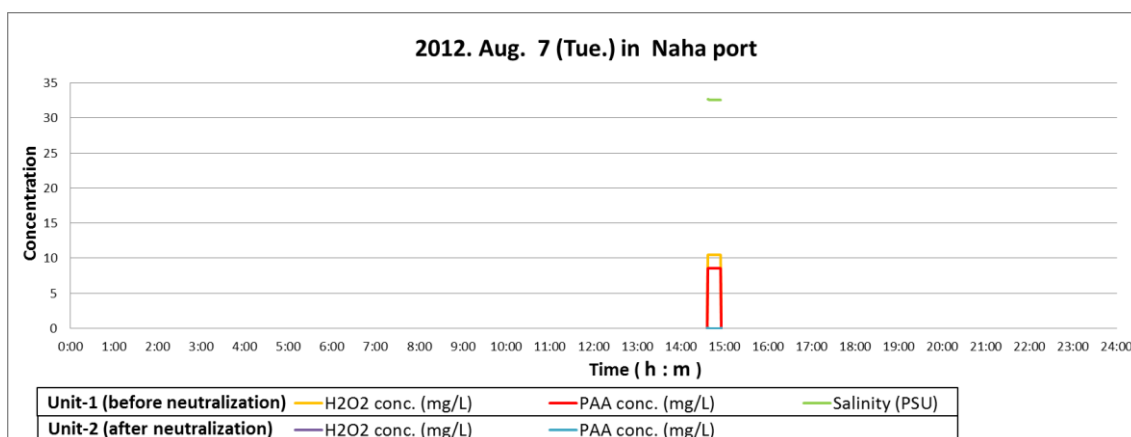
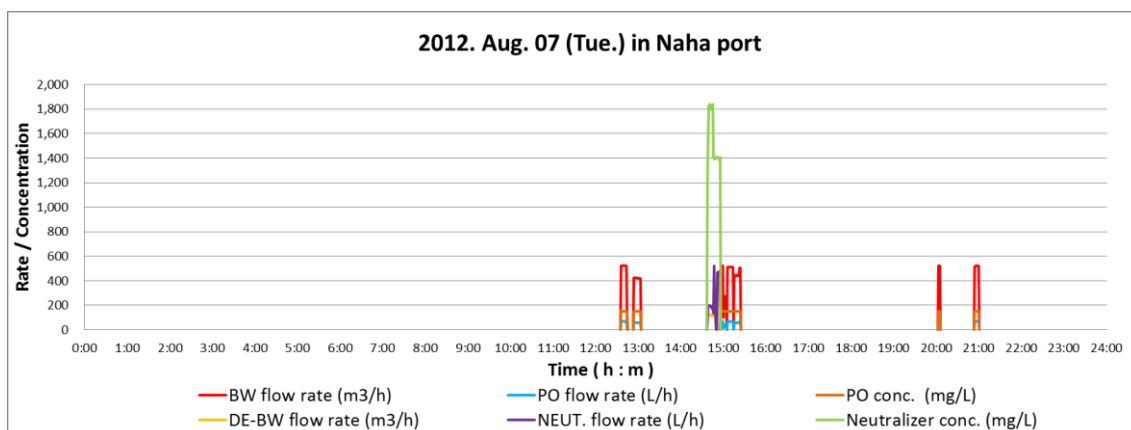


Figure 4-1-1(59) System operation data (2012/08/7)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

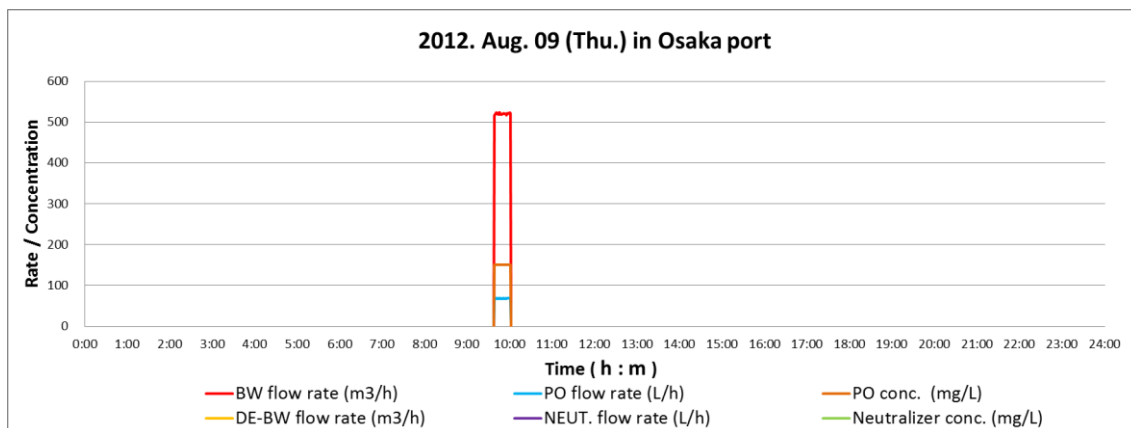


Figure 4-1-1(60) System operation data (2012/08/9)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

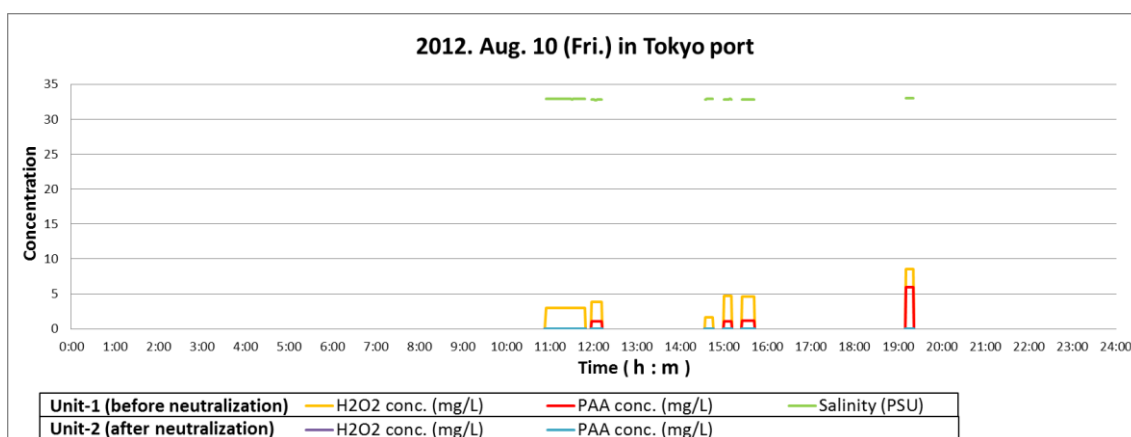
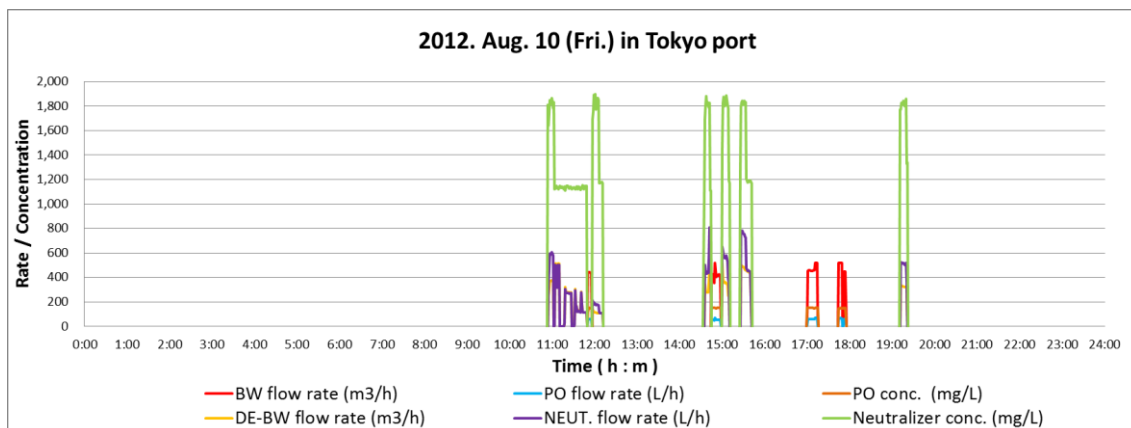


Figure 4-1-1(61) System operation data (2012/08/10)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

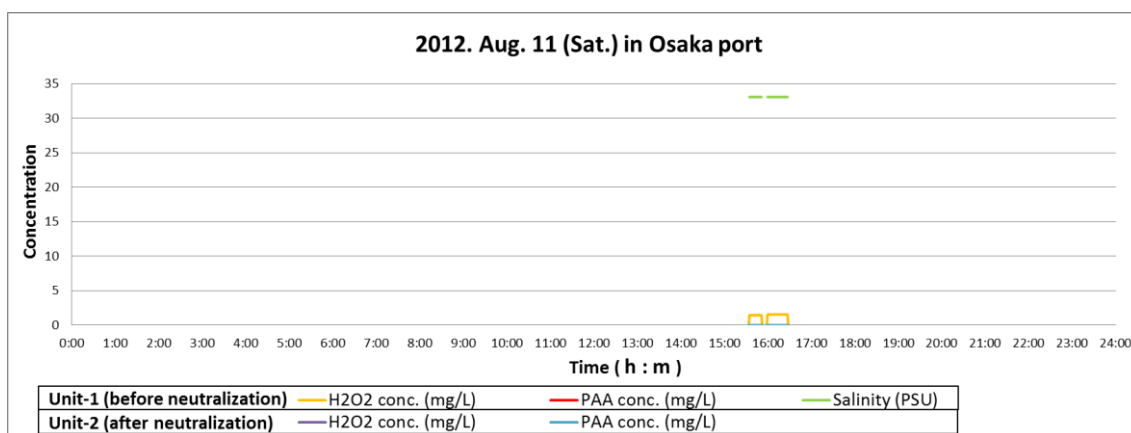
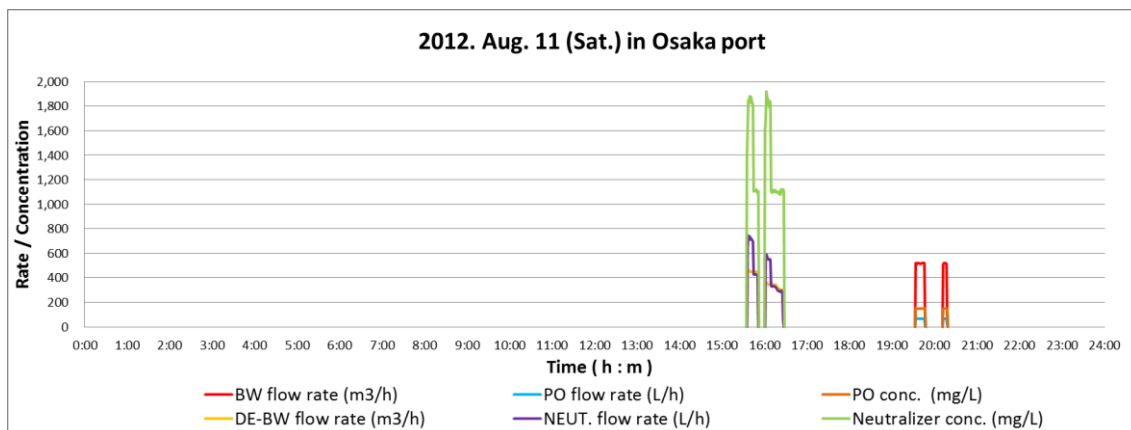


Figure 4-1-1(62) System operation data (2012/08/11)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

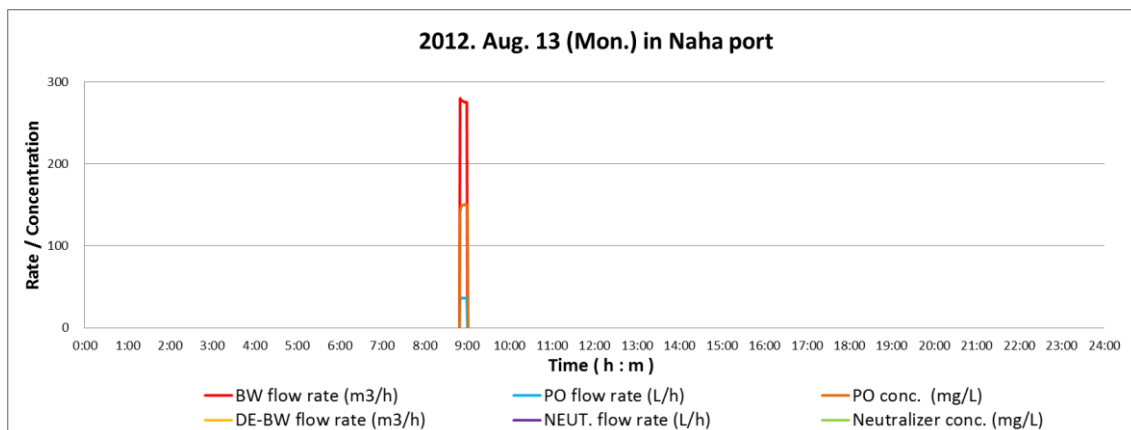


Figure 4-1-1(63) System operation data (2012/08/13)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

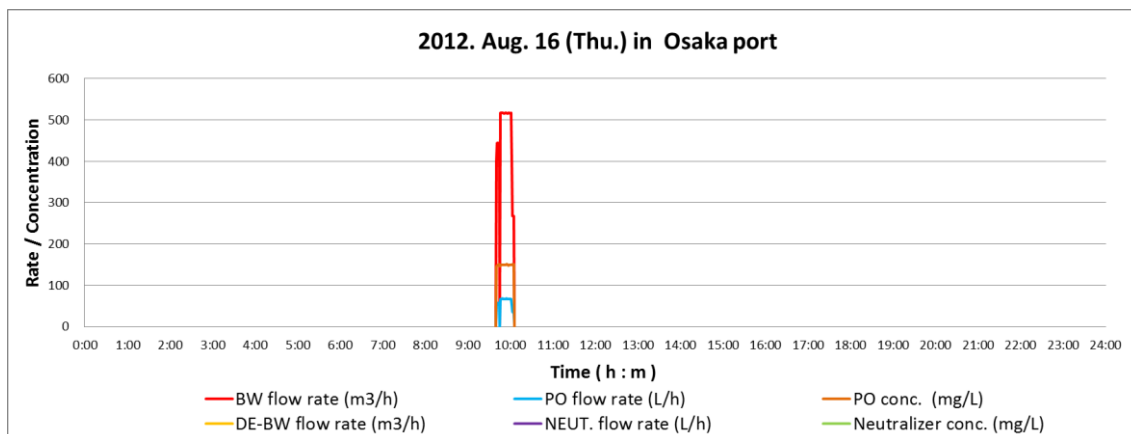


Figure 4-1-1(64) System operation data (2012/08/16)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H₂O₂, PAA)) of the test on de-ballasting.

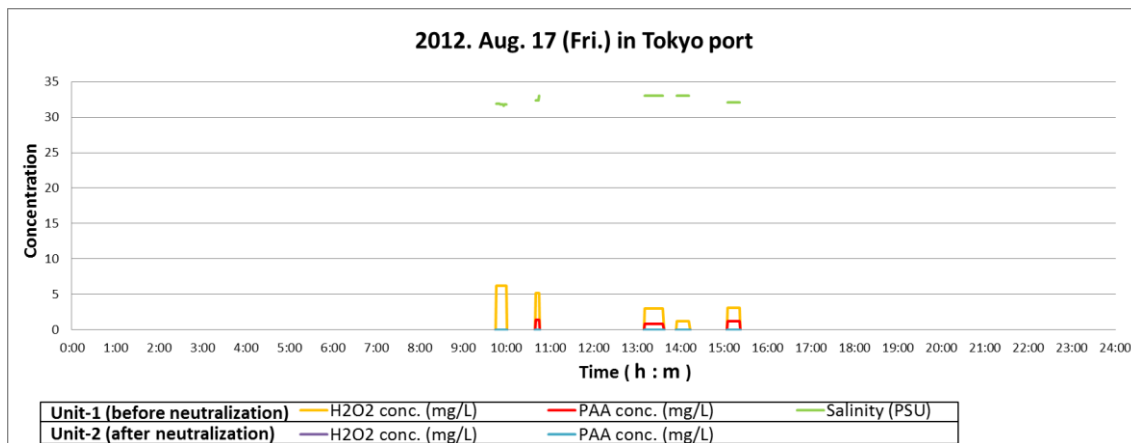
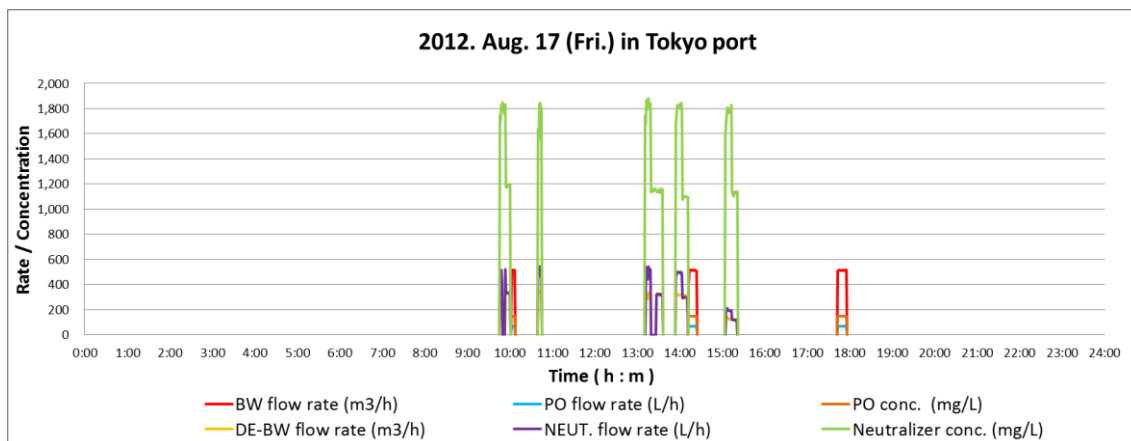


Figure 4-1-1(65) System operation data (2012/08/17)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

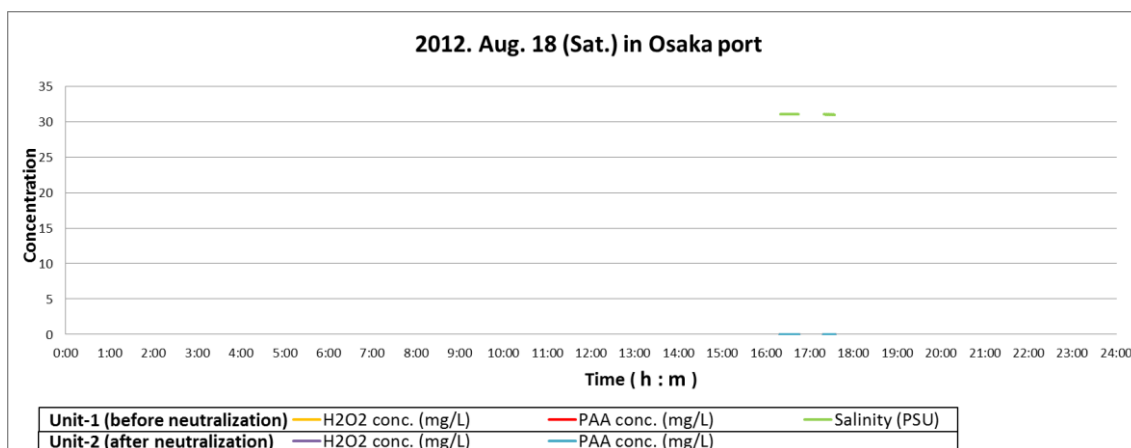
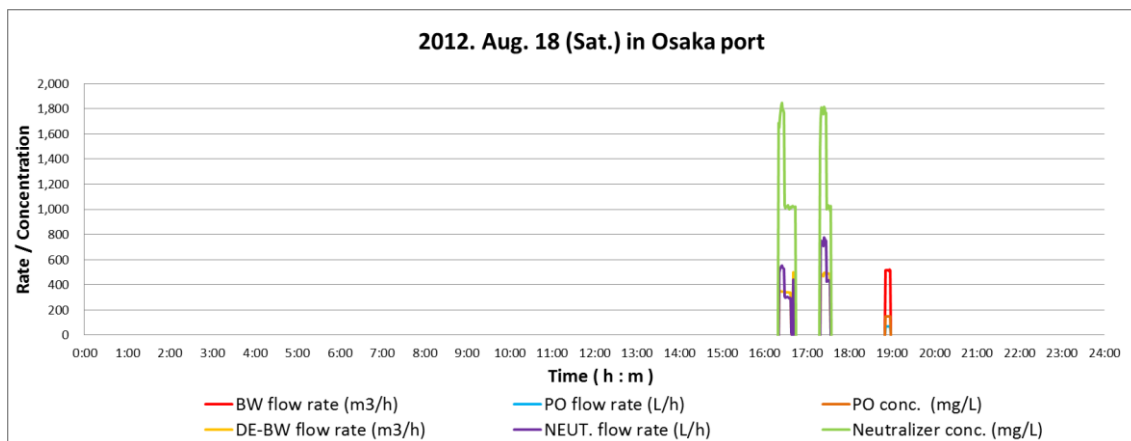


Figure 4-1-1(66) System operation data (2012/08/18)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

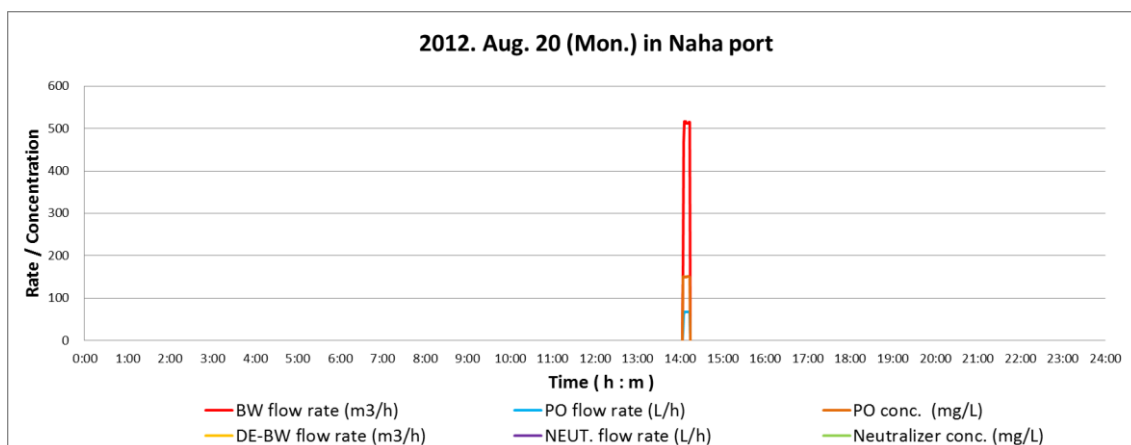


Figure 4-1-1(67) System operation data (2012/08/20)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

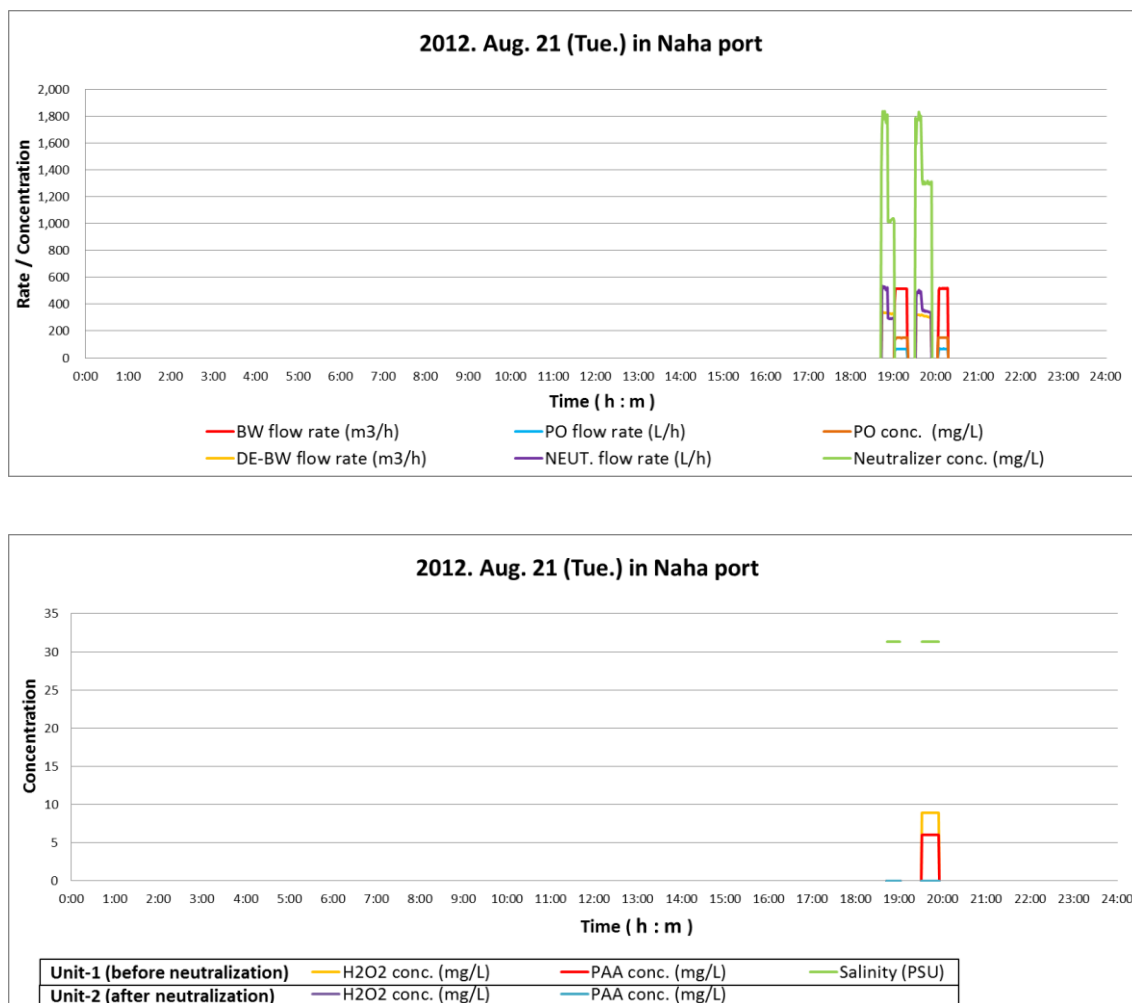


Figure 4-1-1(68) System operation data (2012/08/21)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

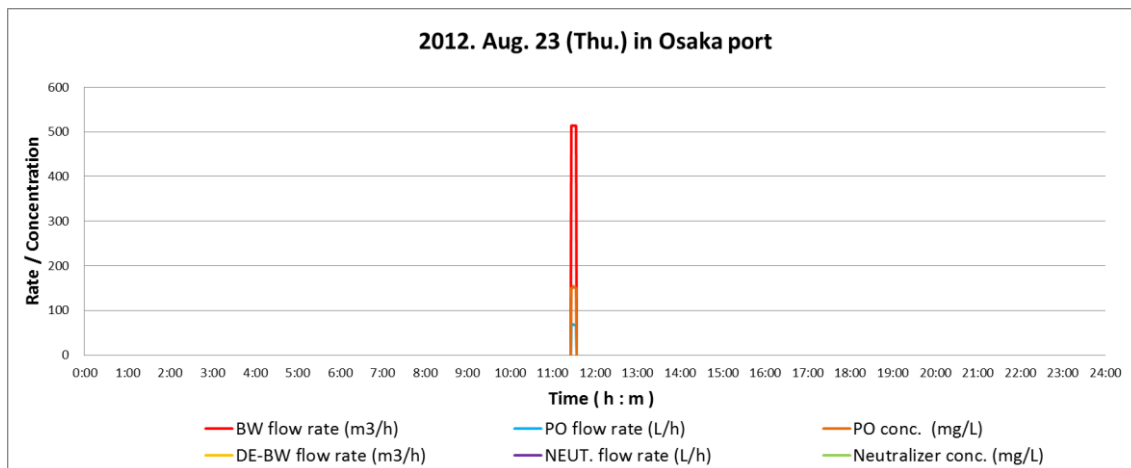


Figure 4-1-1(69) System operation data (2012/08/23)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

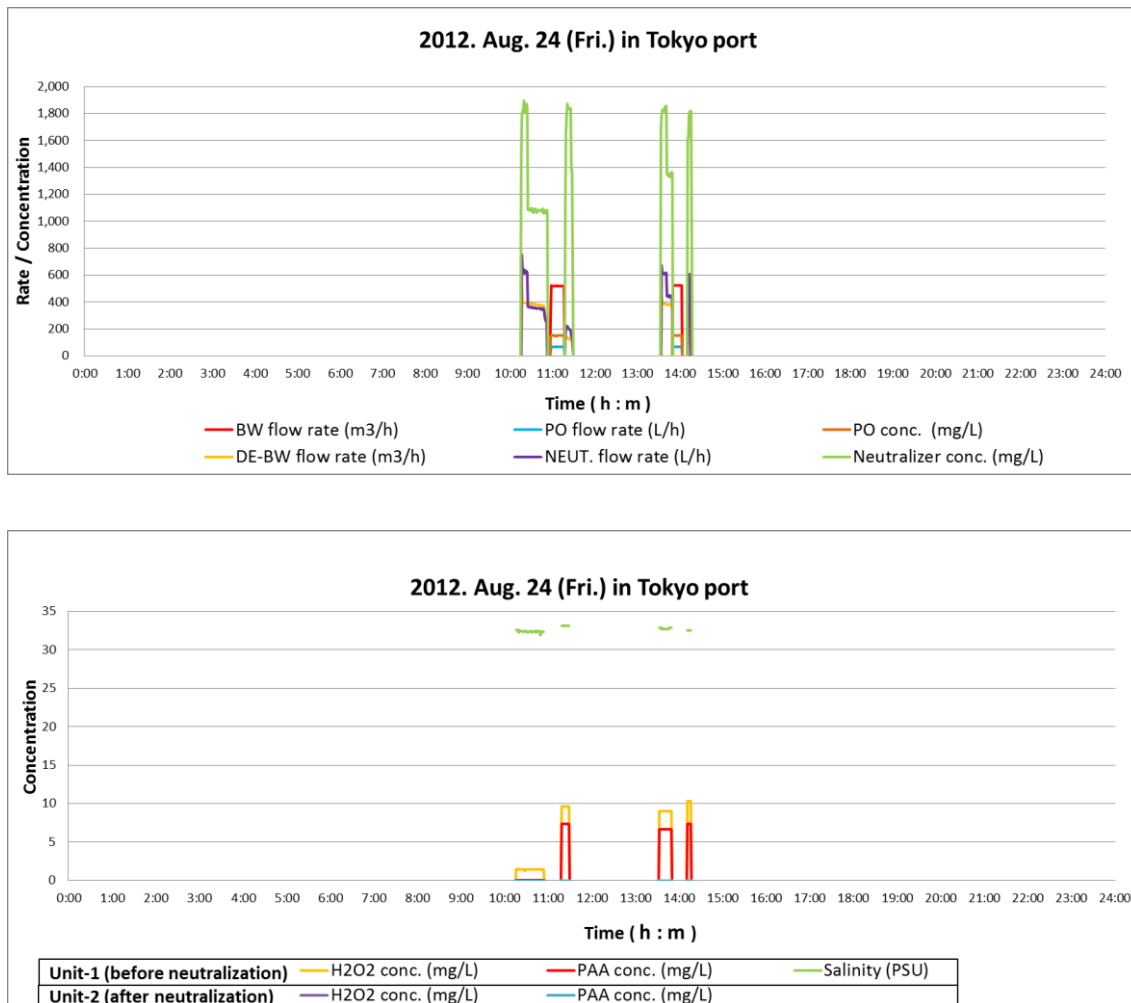


Figure 4-1-1(70) System operation data (2012/08/24)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

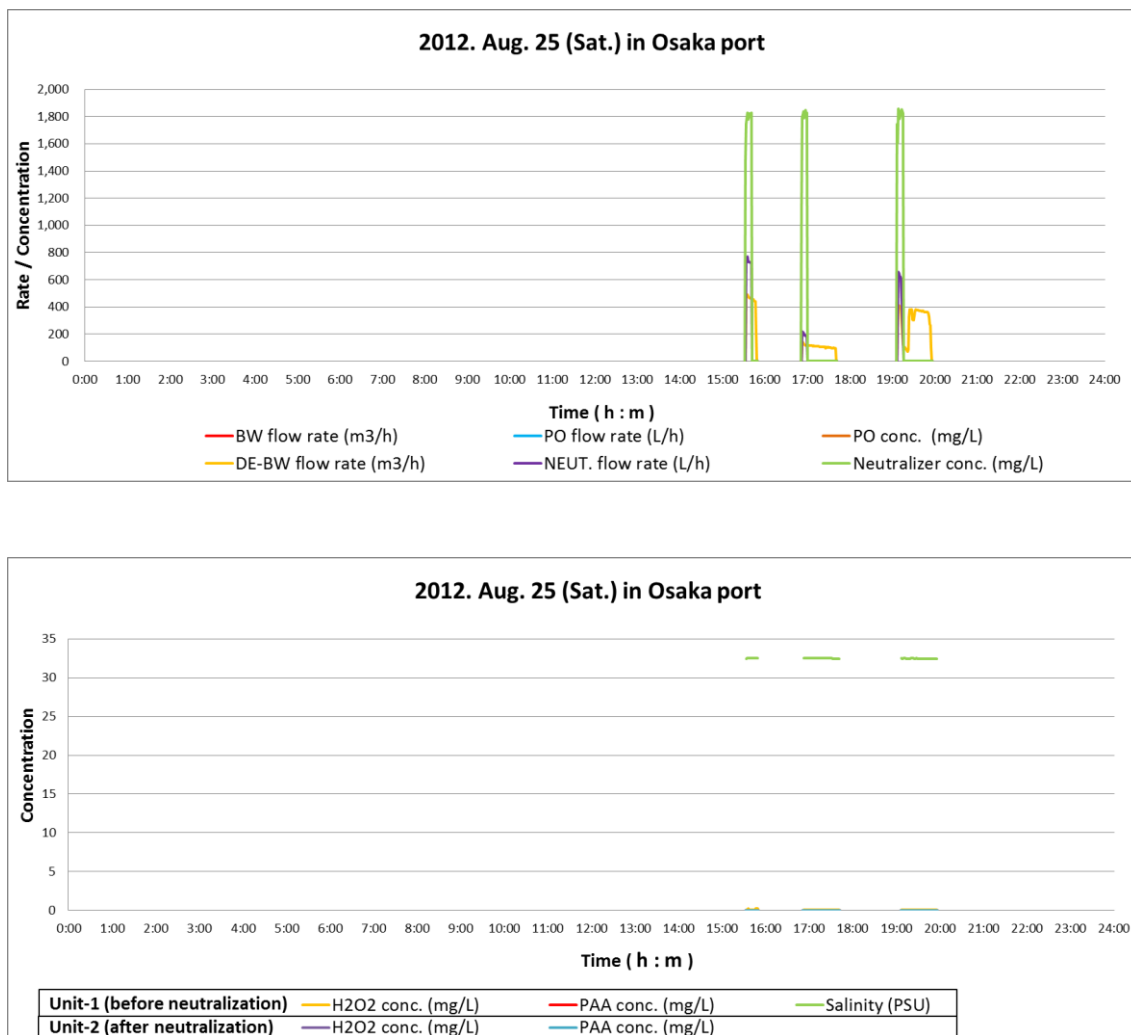


Figure 4-1-1(71) System operation data (2012/08/25)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

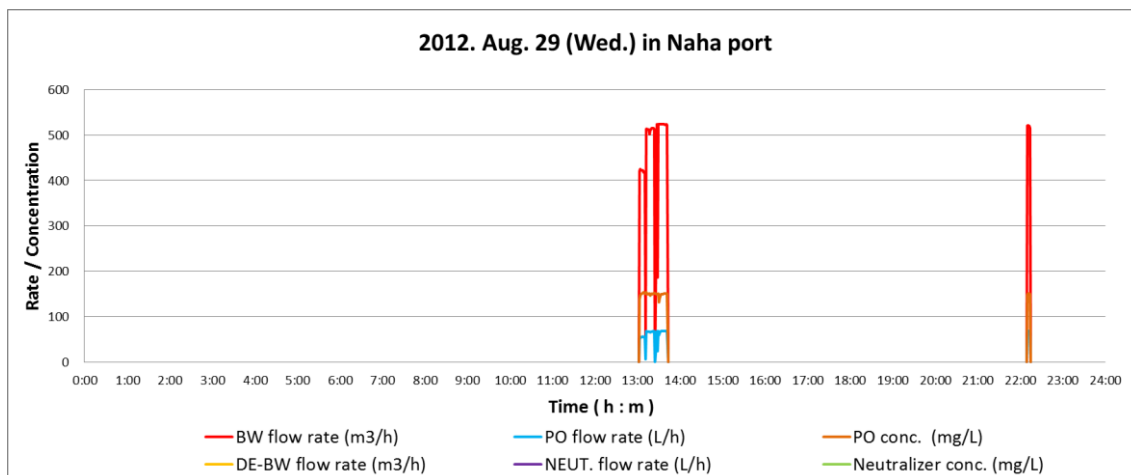


Figure 4-1-1(72) System operation data (2012/08/29)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

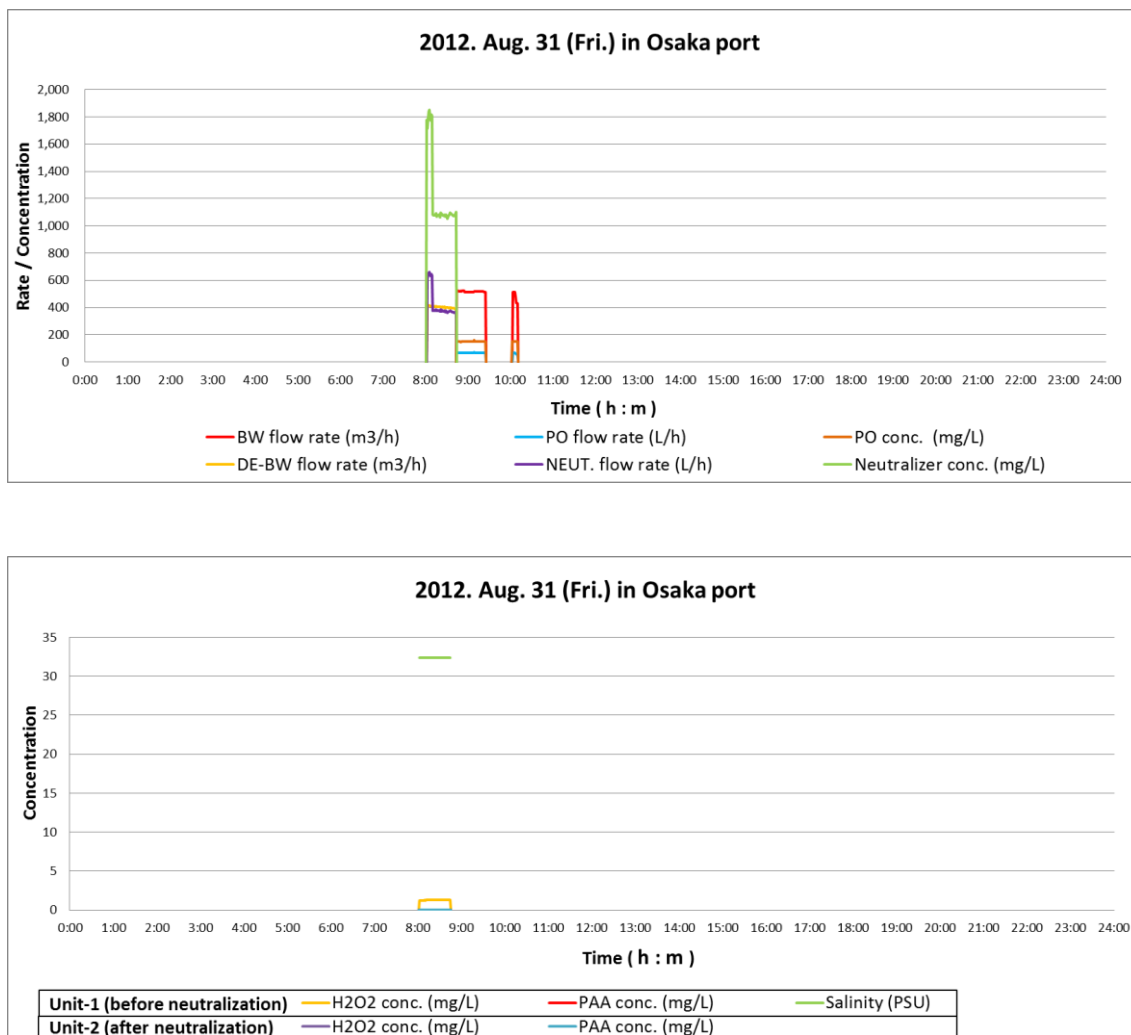


Figure 4-1-1(73) System operation data (2012/08/31)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

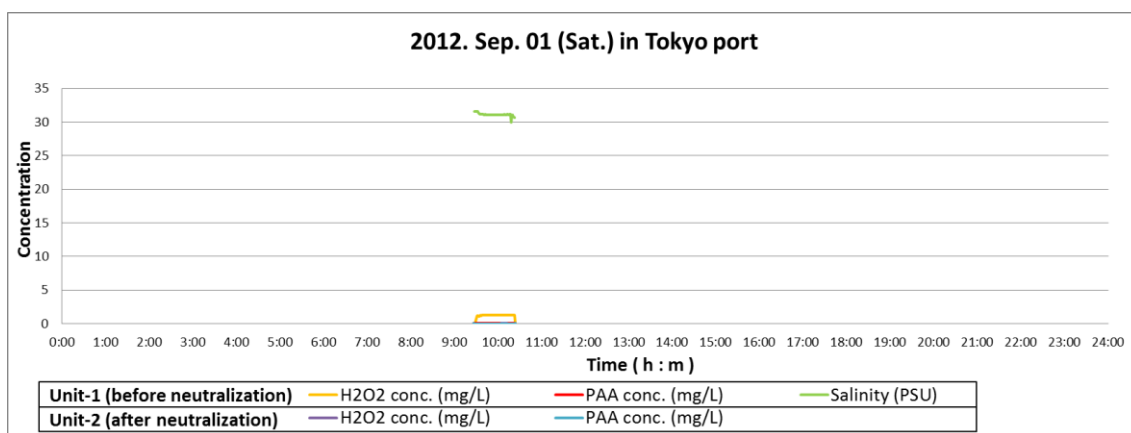
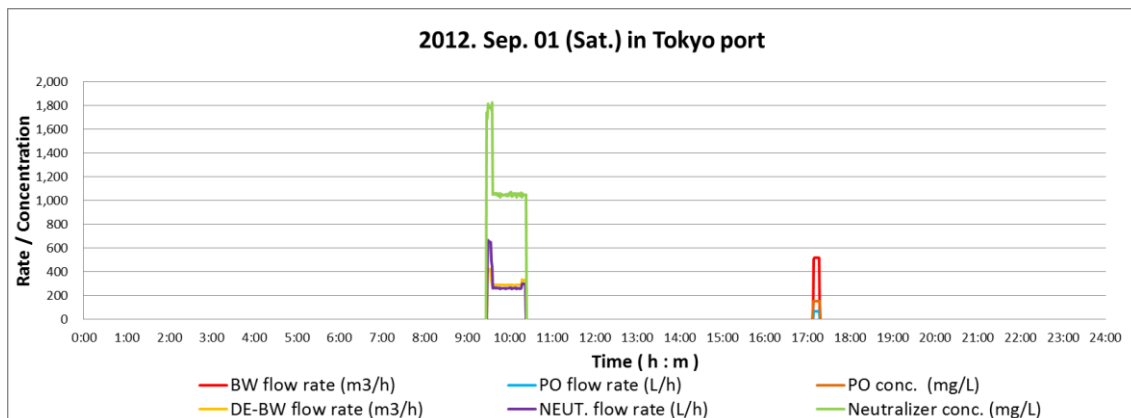


Figure 4-1-1(74) System operation data (2012/09/1)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

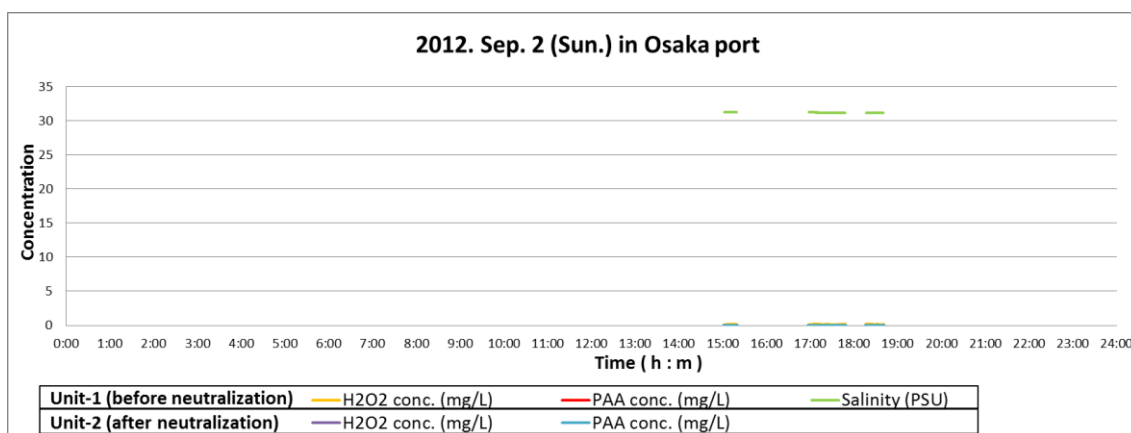
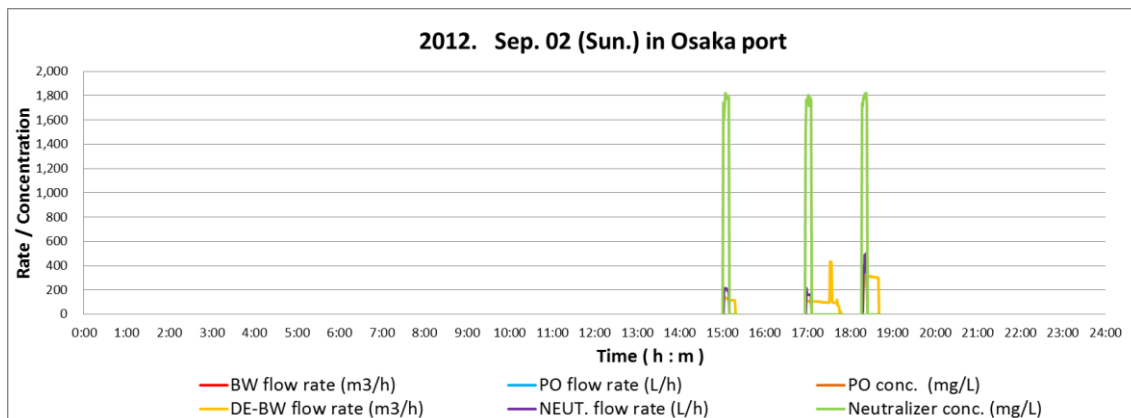


Figure 4-1-1(75) System operation data (2012/09/2)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

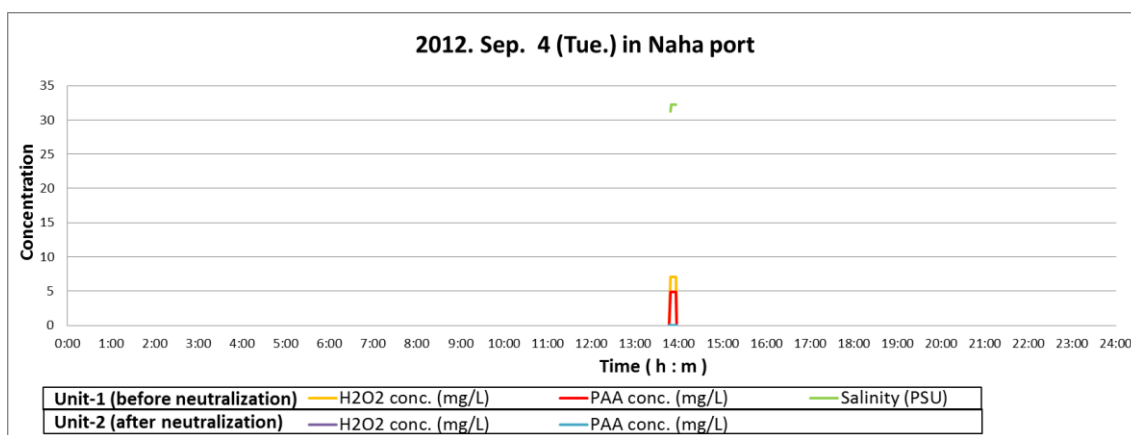
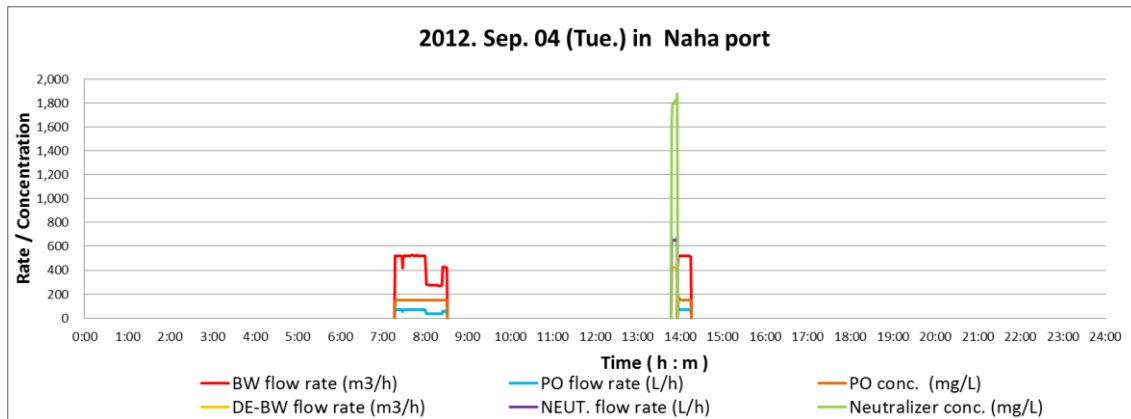


Figure 4-1-1(76) System operation data (2012/09/4)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

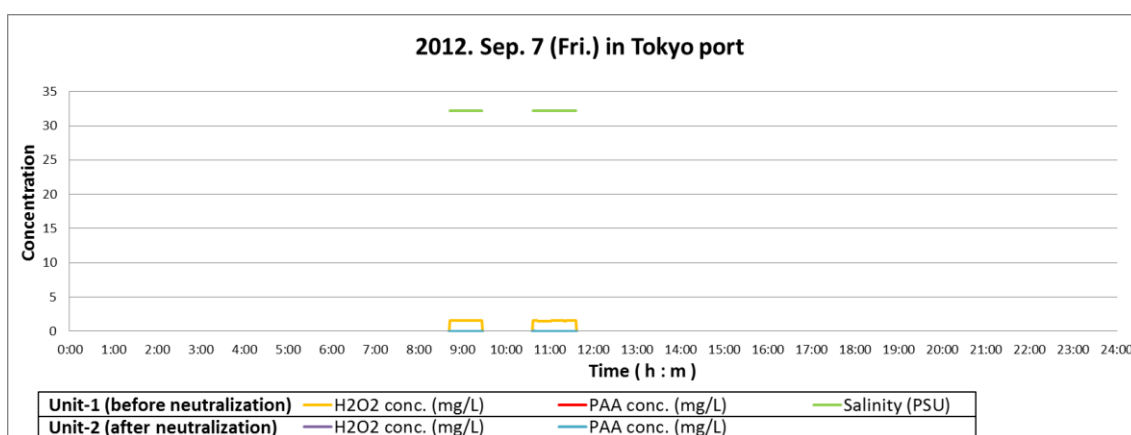
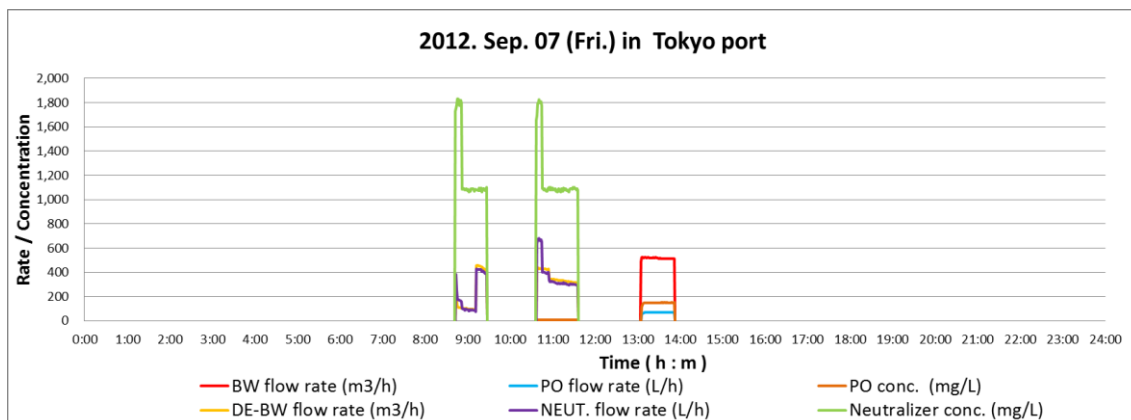


Figure 4-1-1(77) System operation data (2012/09/7)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

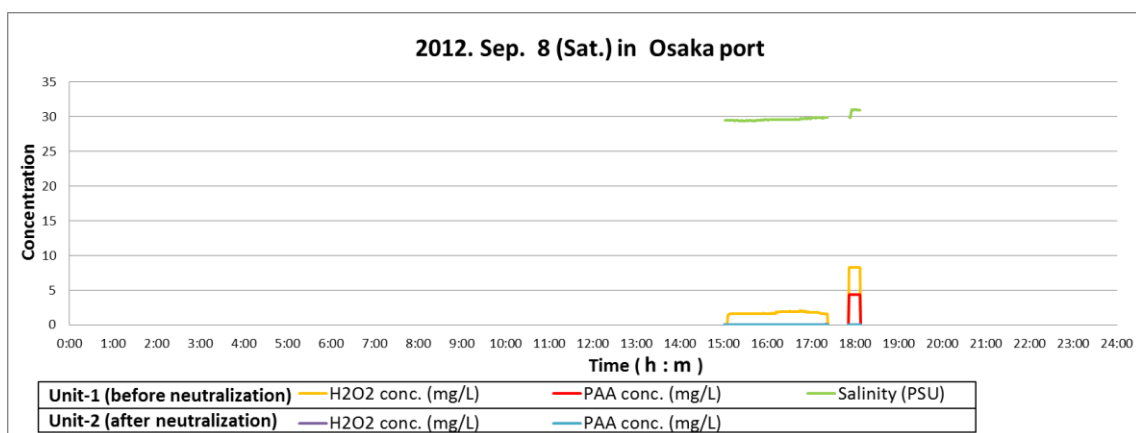
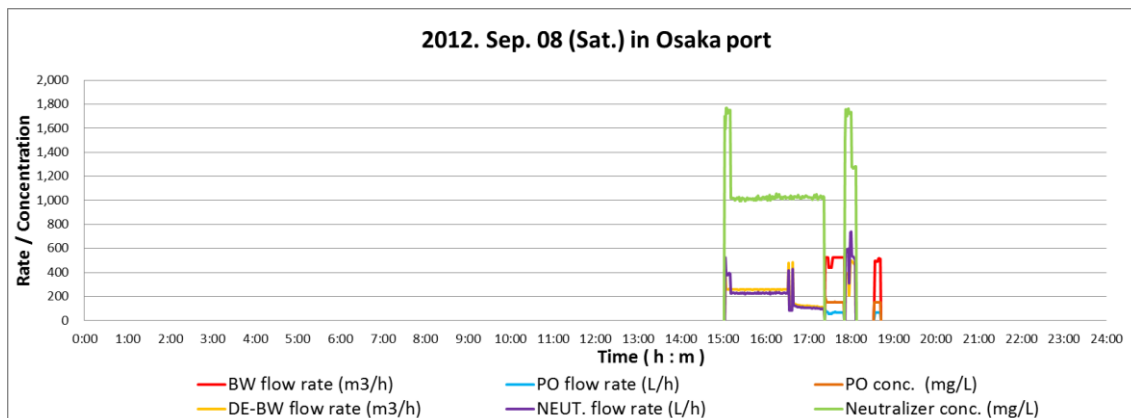


Figure 4-1-1(78) System operation data (2012/09/8)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

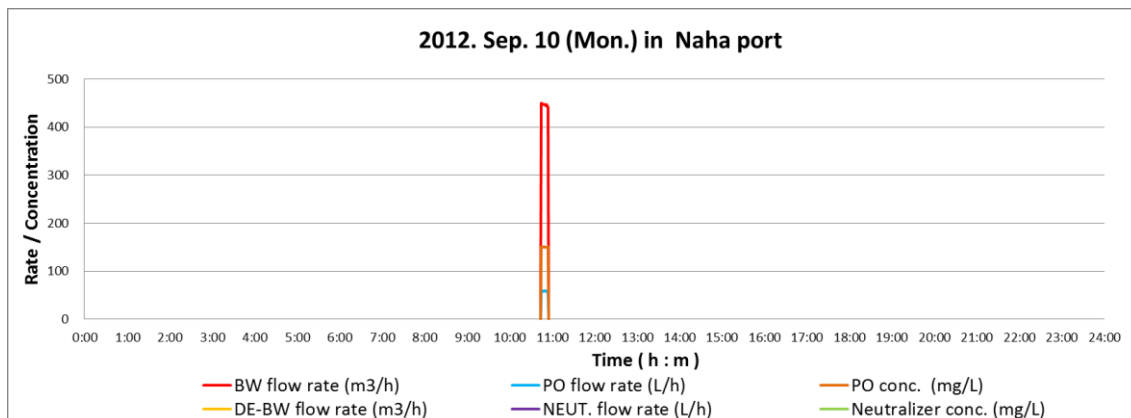


Figure 4-1-1(79) System operation data (2012/09/10)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

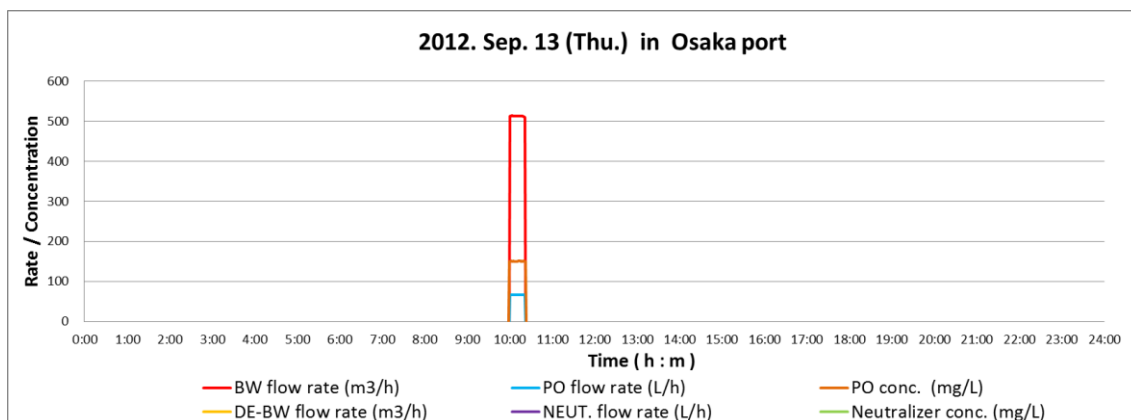


Figure 4-1-1(80) System operation data (2012/09/13)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

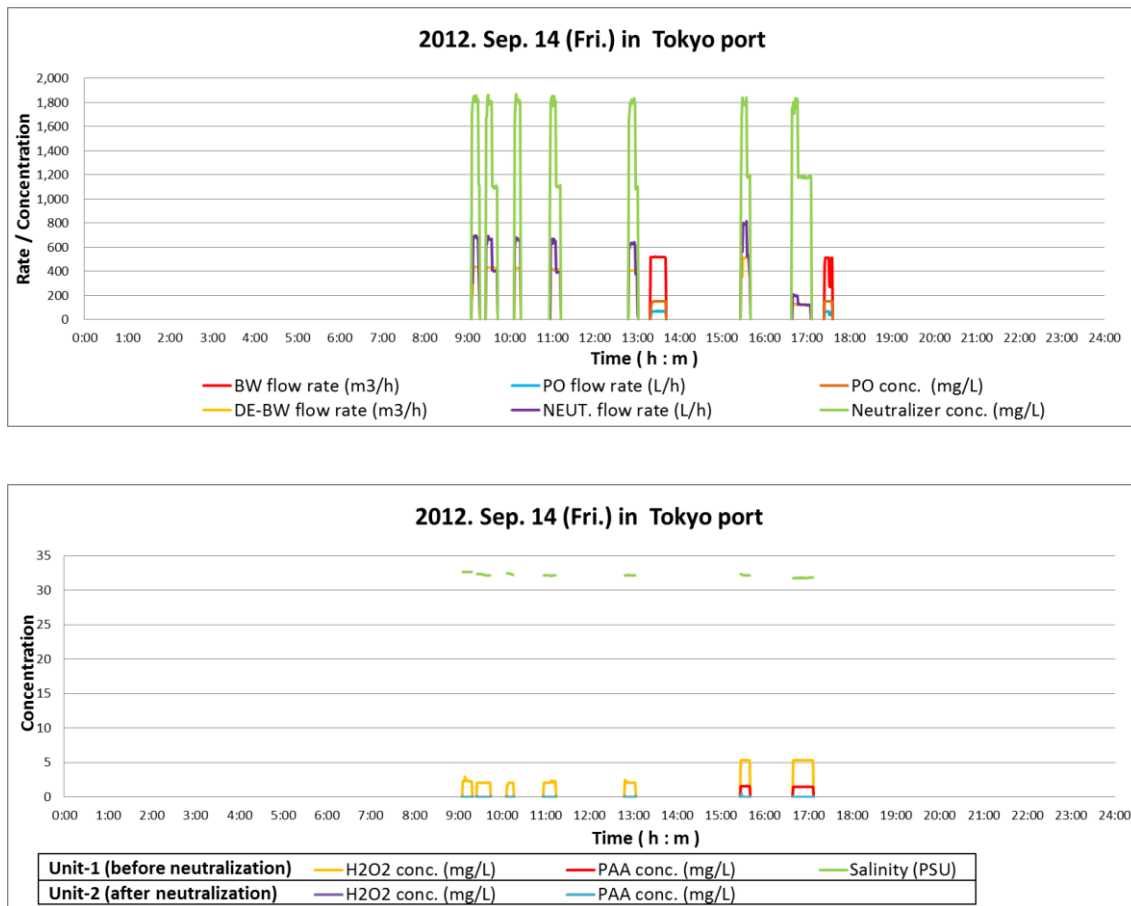


Figure 4-1-1(81) System operation data (2012/09/14)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

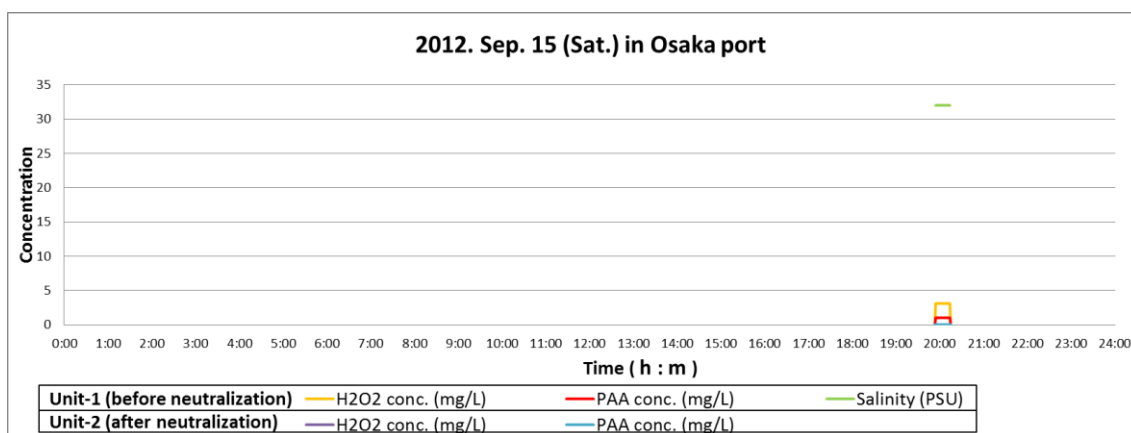
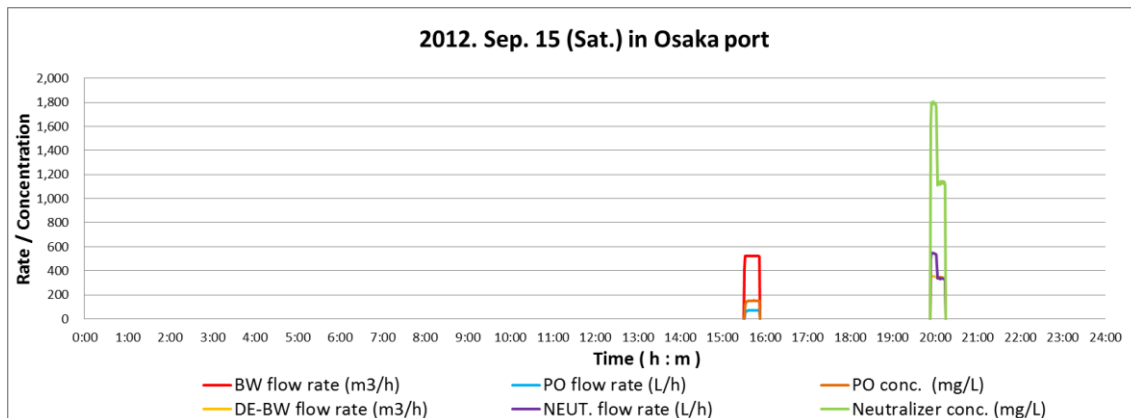


Figure 4-1-1(82) System operation data (2012/09/15)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

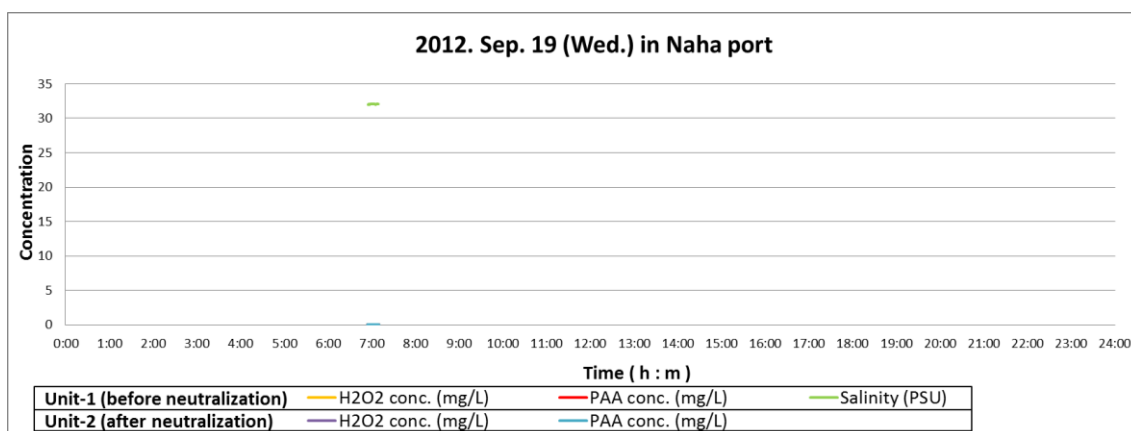
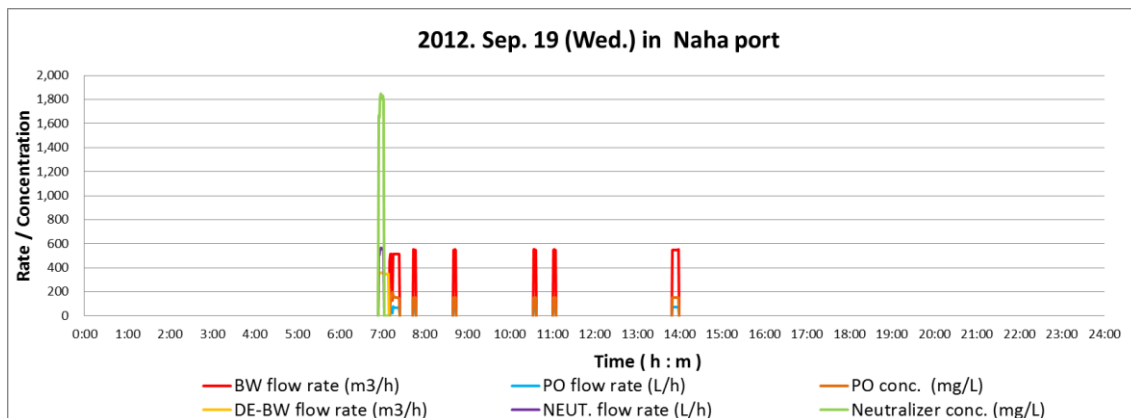


Figure 4-1-1(83) System operation data (2012/09/19)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

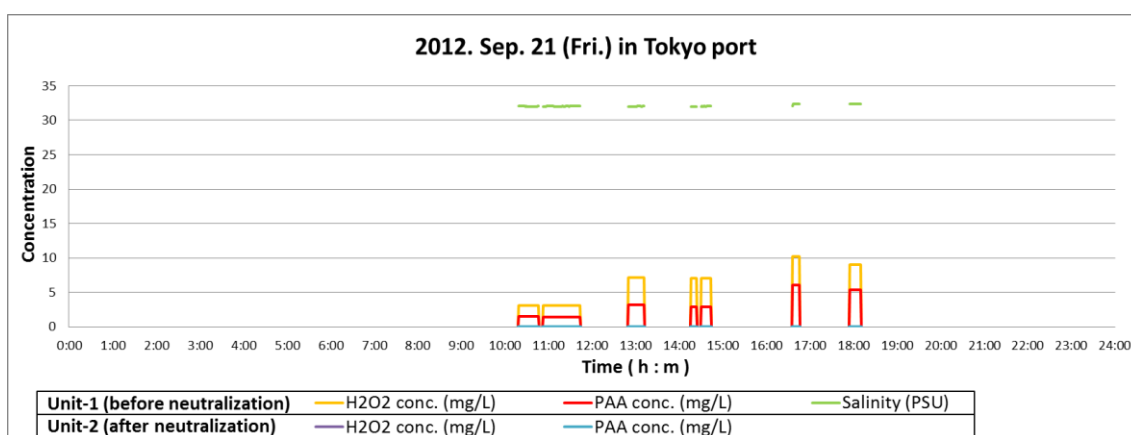
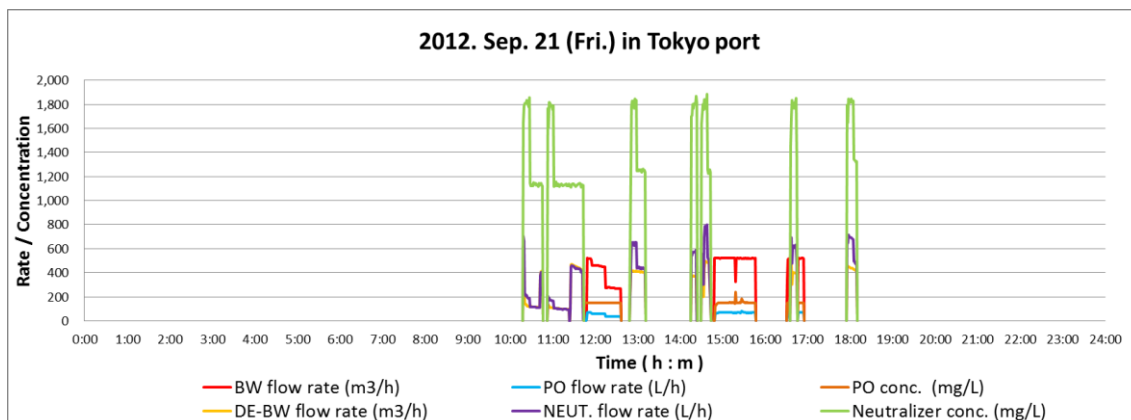


Figure 4-1-1(84) System operation data (2012/09/21)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

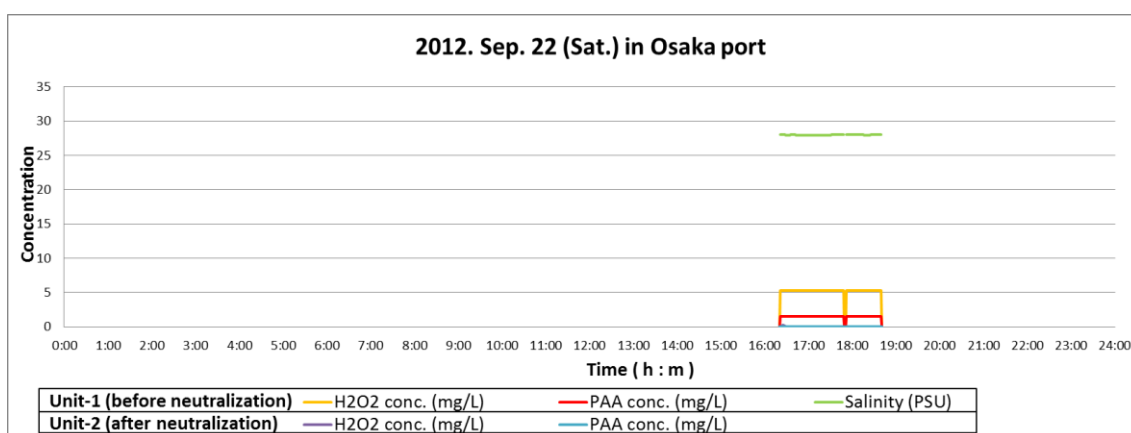
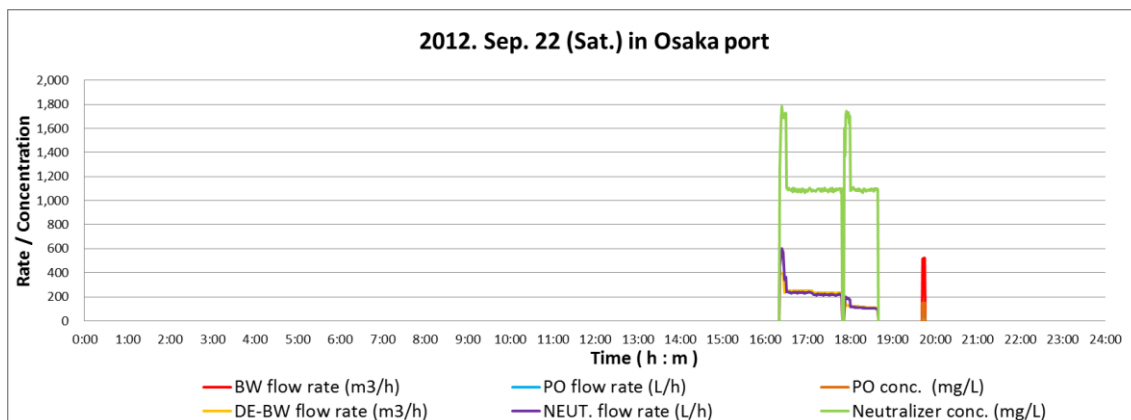


Figure 4-1-1(85) System operation data (2012/09/22)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

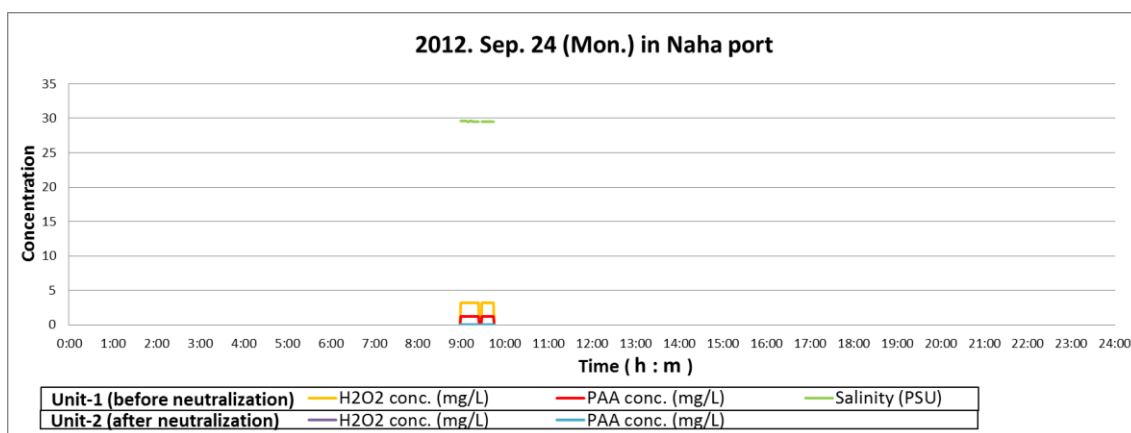
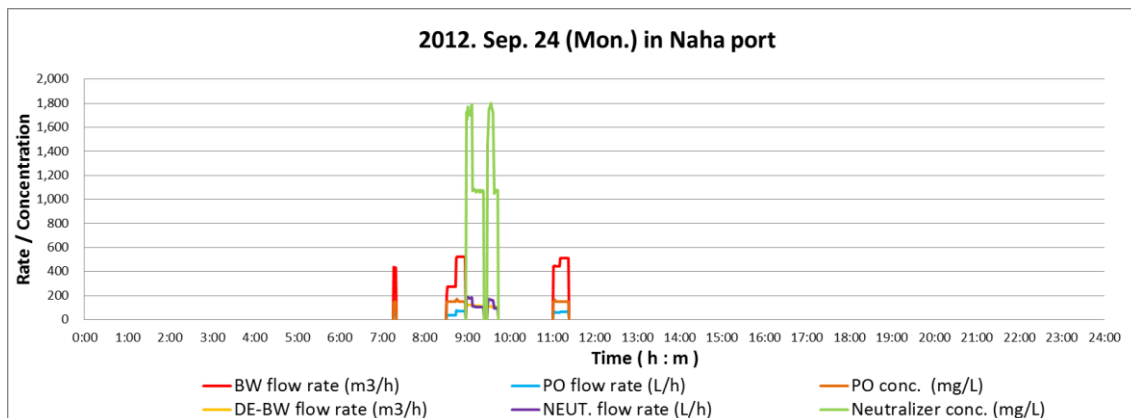


Figure 4-1-1(86) System operation data (2012/09/24)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

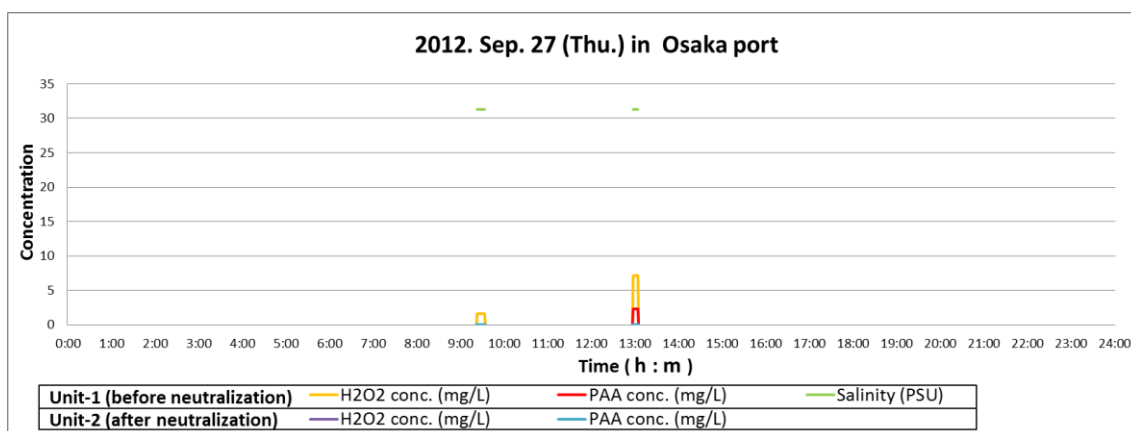
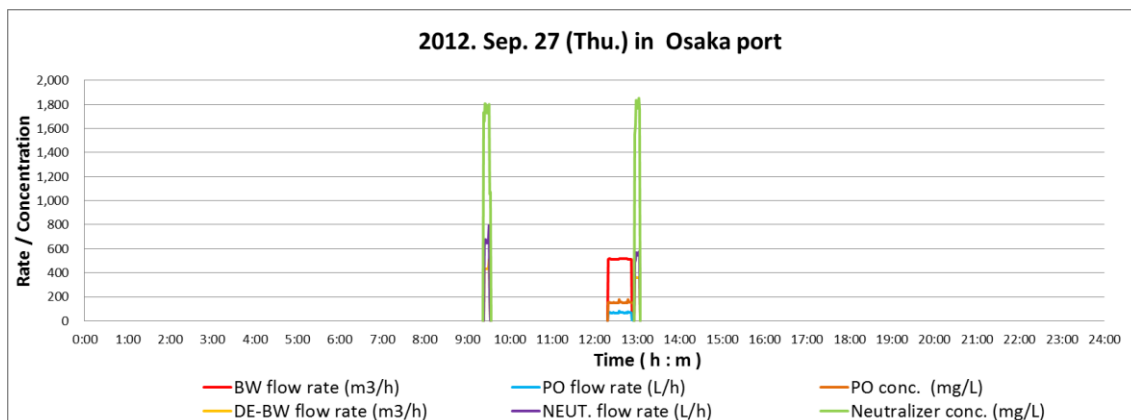


Figure 4-1-1(87) System operation data (2012/09/27)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

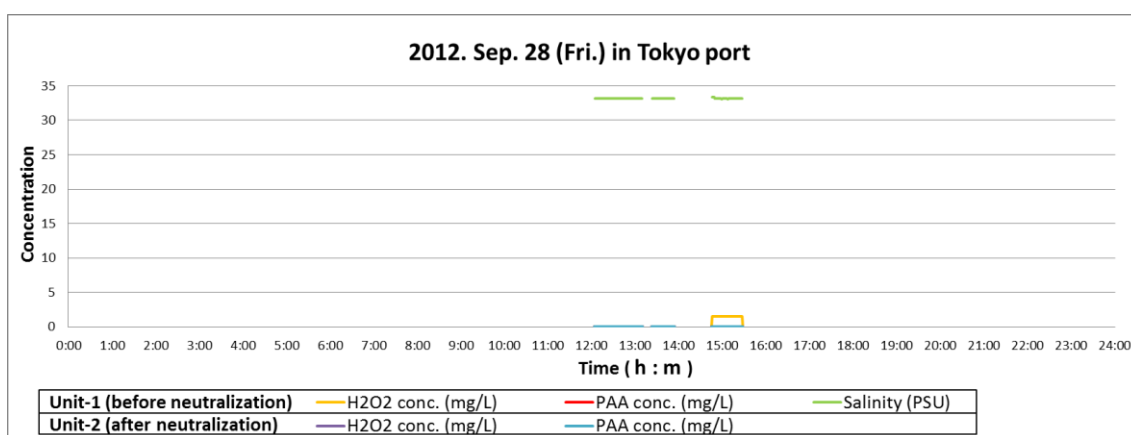
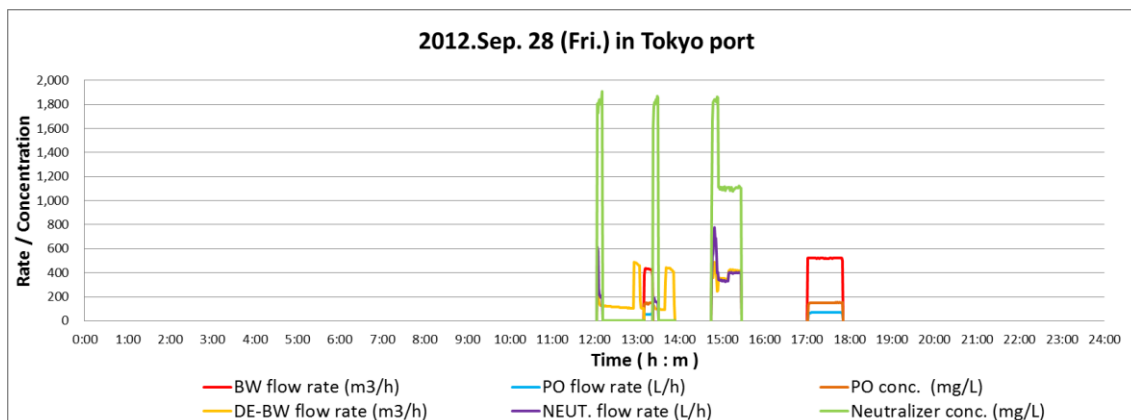


Figure 4-1-1(88) System operation data (2012/09/28)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

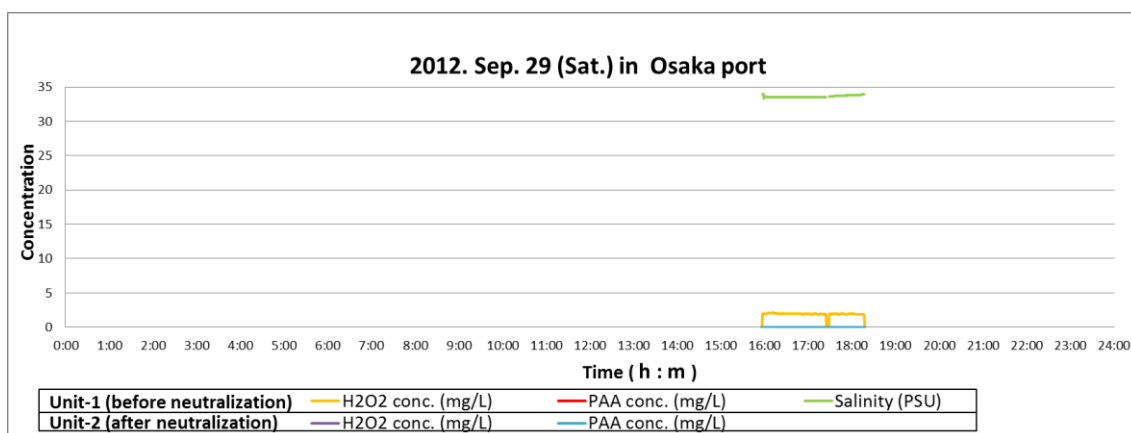
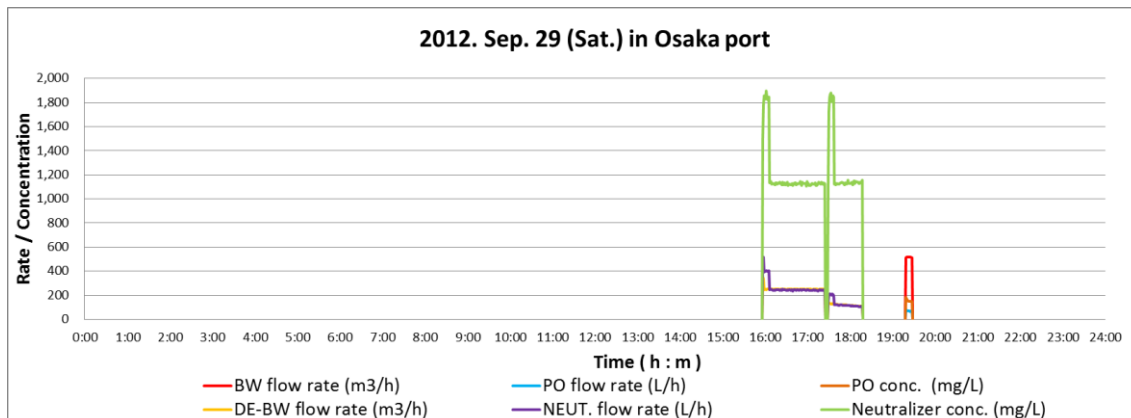


Figure 4-1-1(89) System operation data (2012/09/29)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

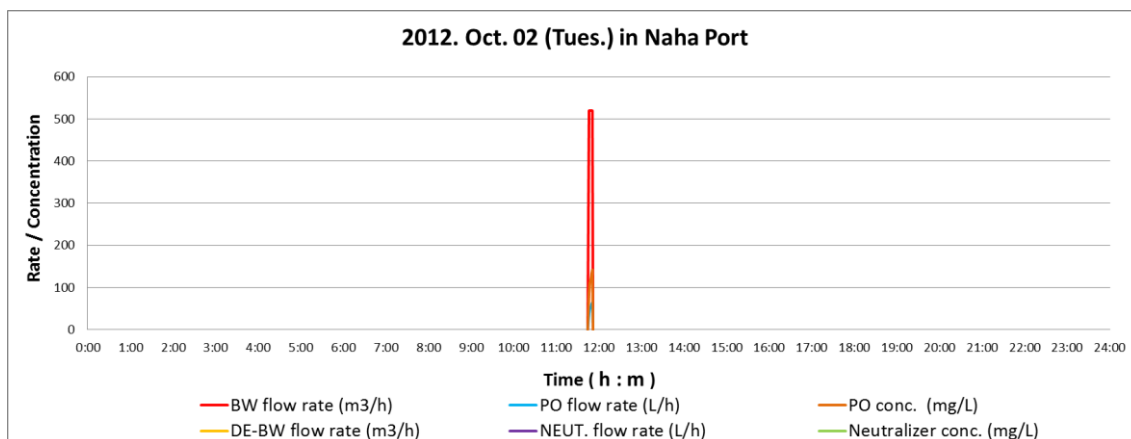


Figure 4-1-1(90) System operation data (2012/10/2)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

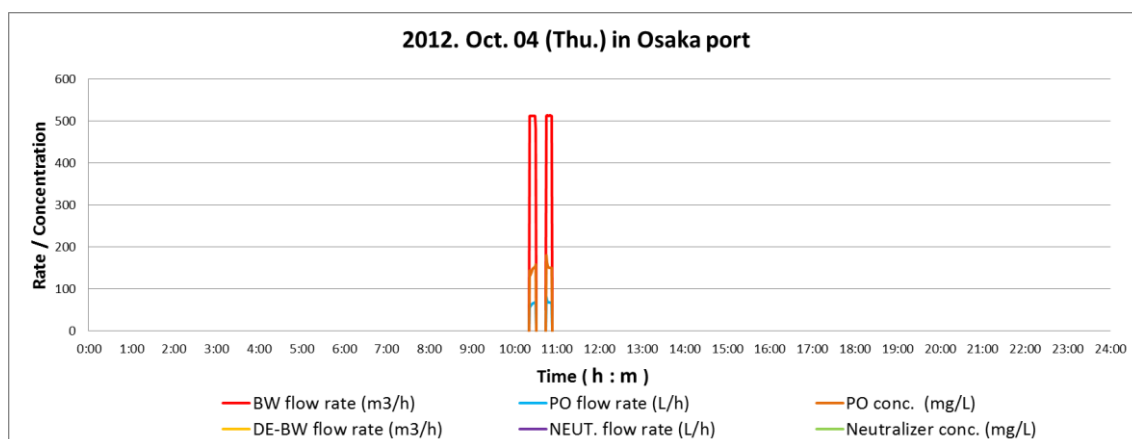


Figure 4-1-1(91) System operation data (2012/10/4)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

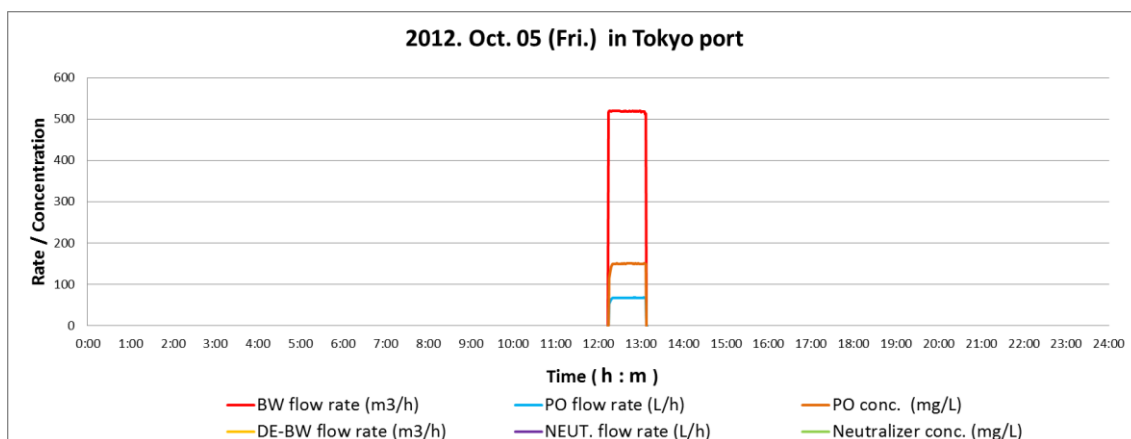


Figure 4-1-1(92) System operation data (2012/10/5)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

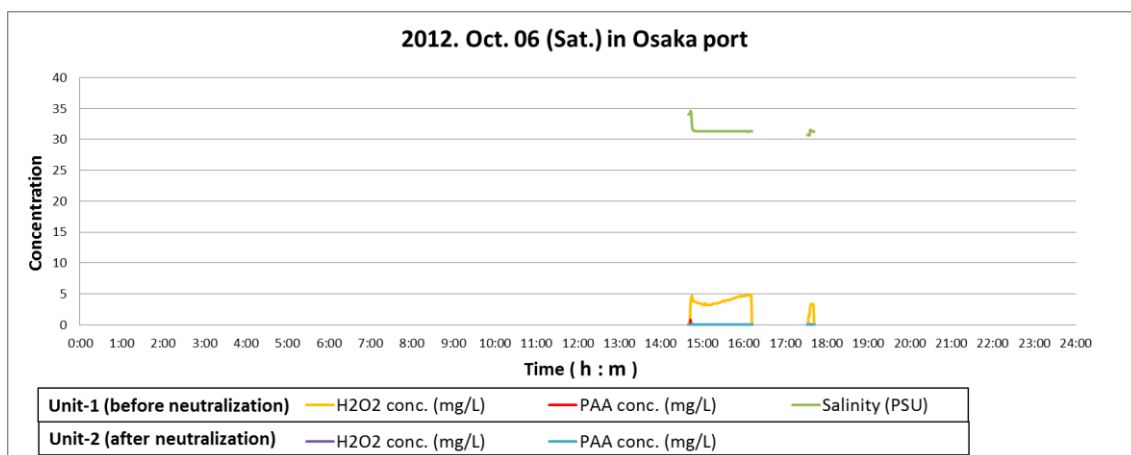
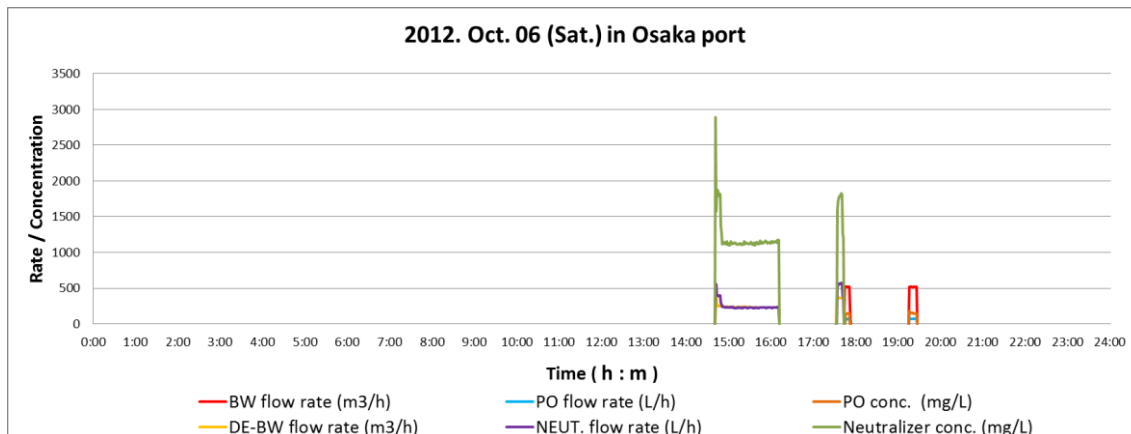


Figure 4-1-1(93) System operation data (2012/10/6)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

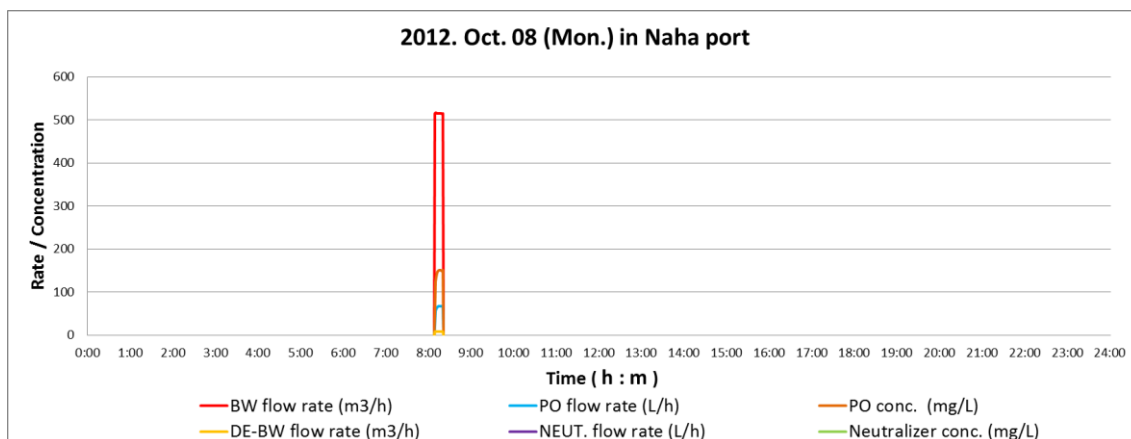


Figure 4-1-1(94) System operation data (2012/10/8)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

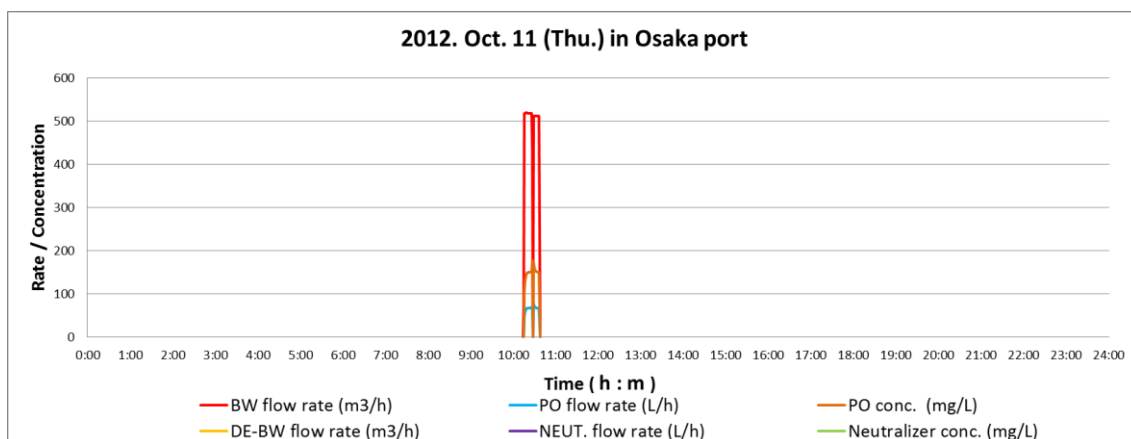


Figure 4-1-1(95) System operation data (2012/10/11)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

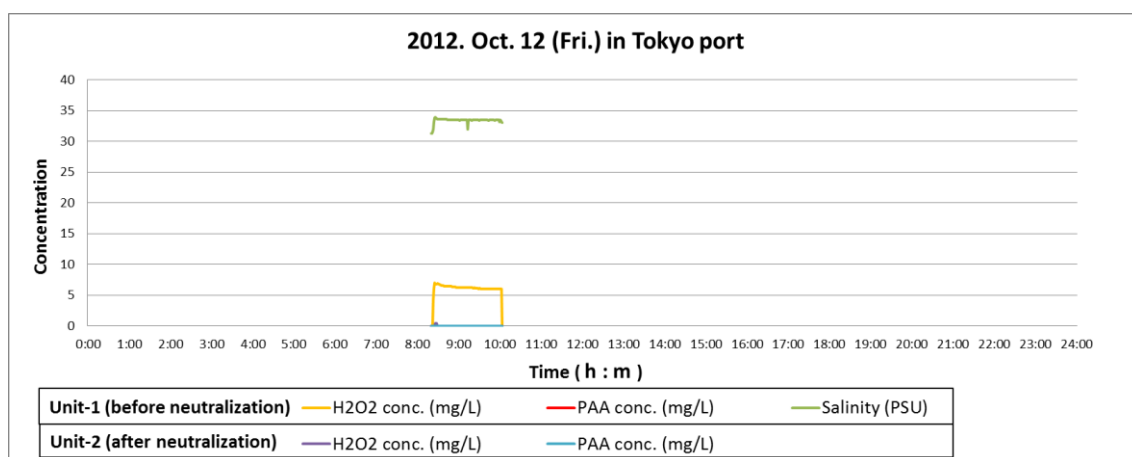
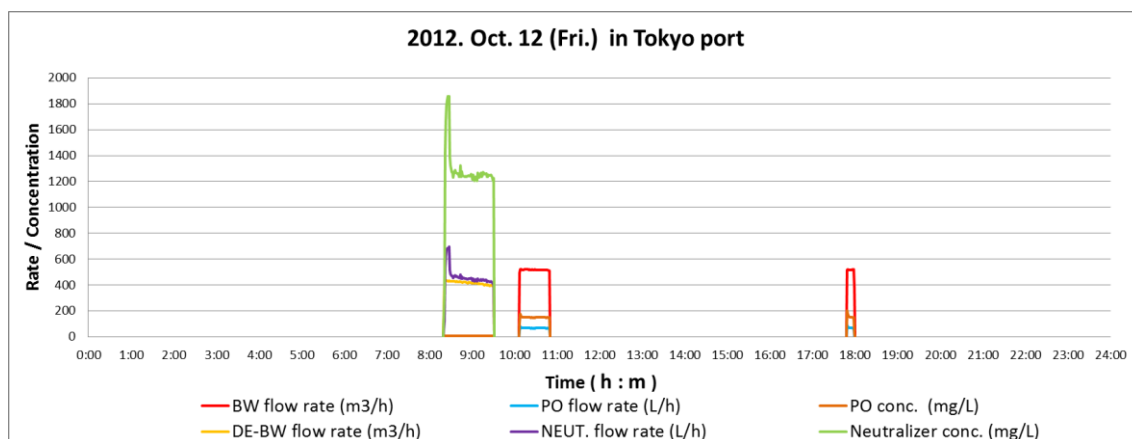


Figure 4-1-1(96) System operation data (2012/10/12)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

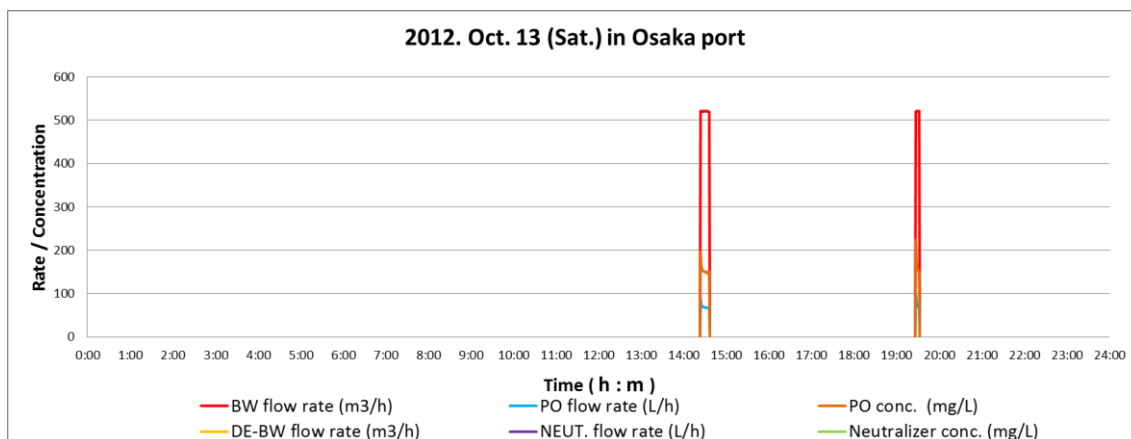


Figure 4-1-1(97) System operation data (2012/10/13)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

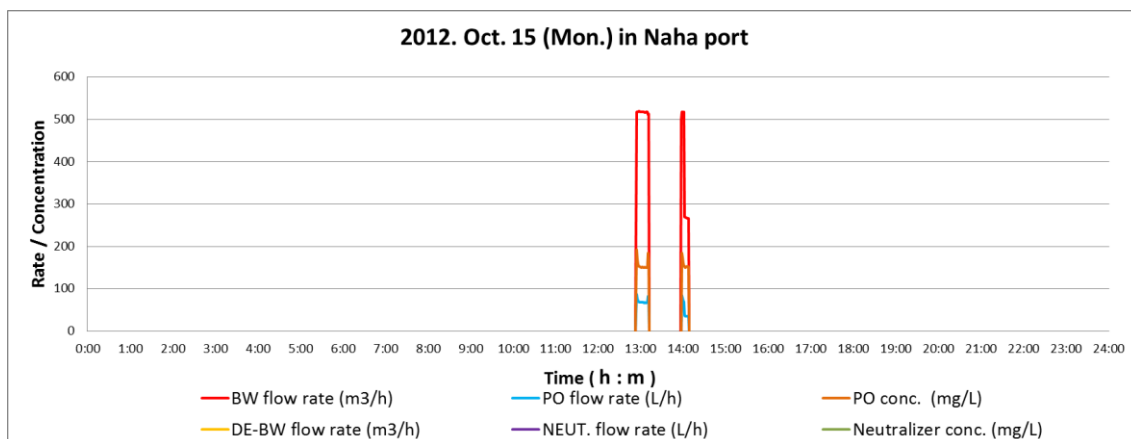


Figure 4-1-1(98) System operation data (2012/10/15)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

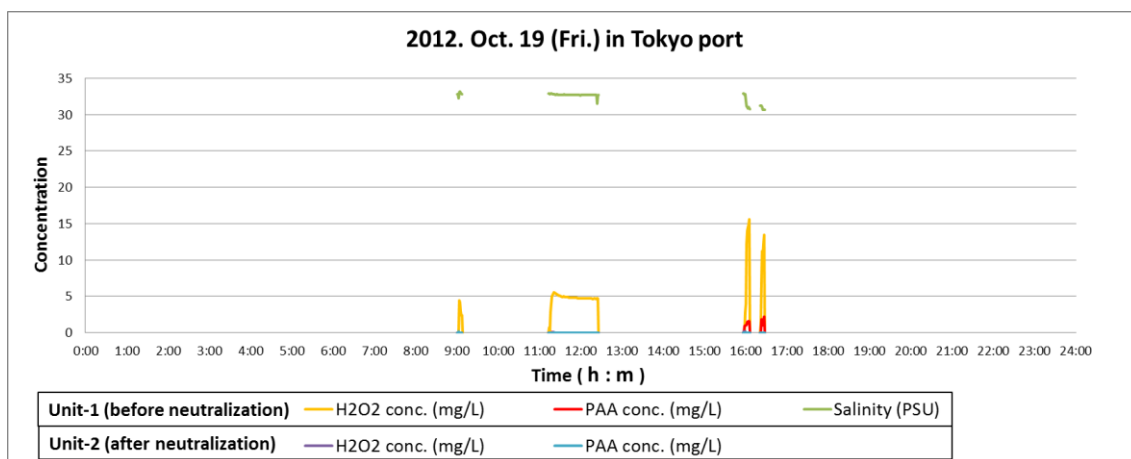
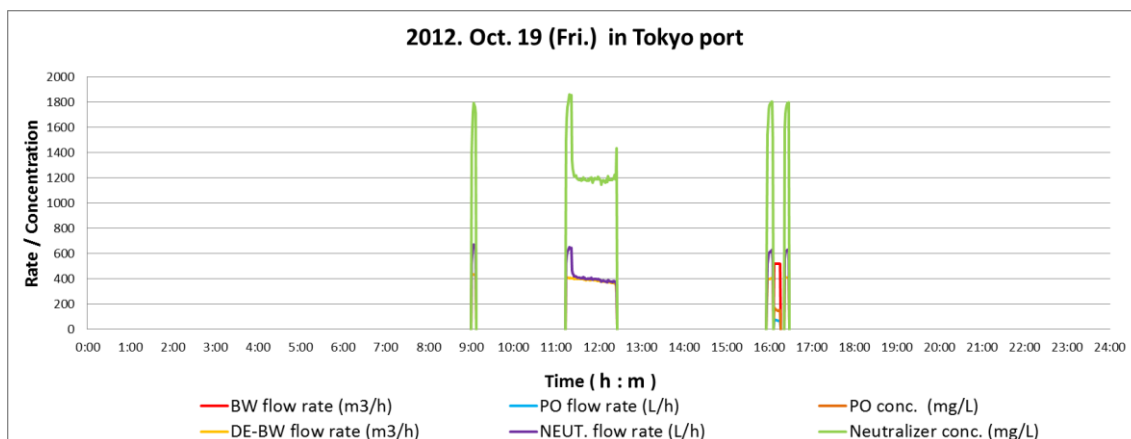


Figure 4-1-1(99) System operation data (2012/10/19)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

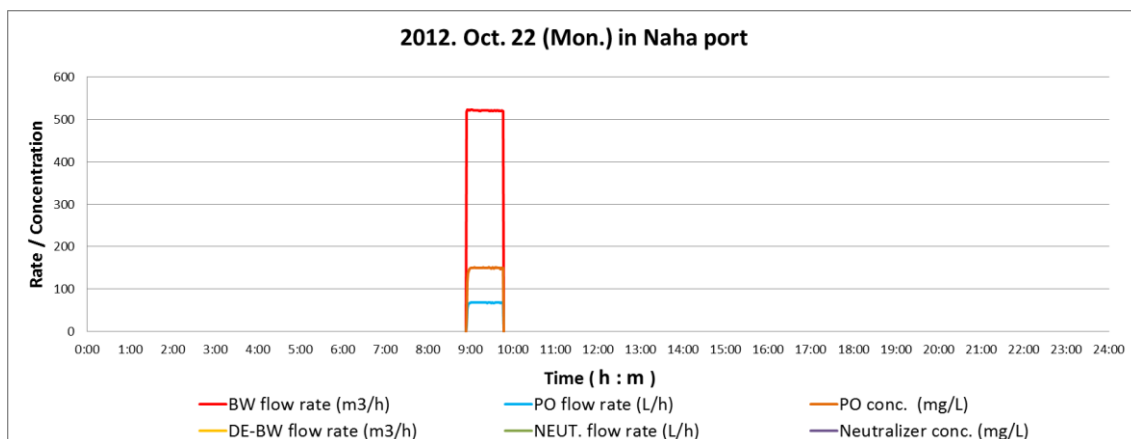


Figure 4-1-1(100) System operation data (2012/10/22)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

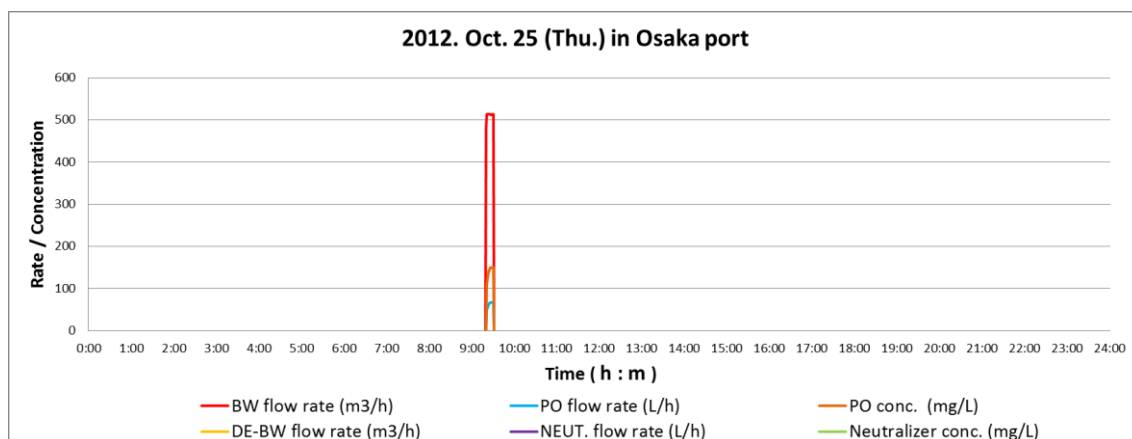


Figure 4-1-1(101) System operation data (2012/10/25)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

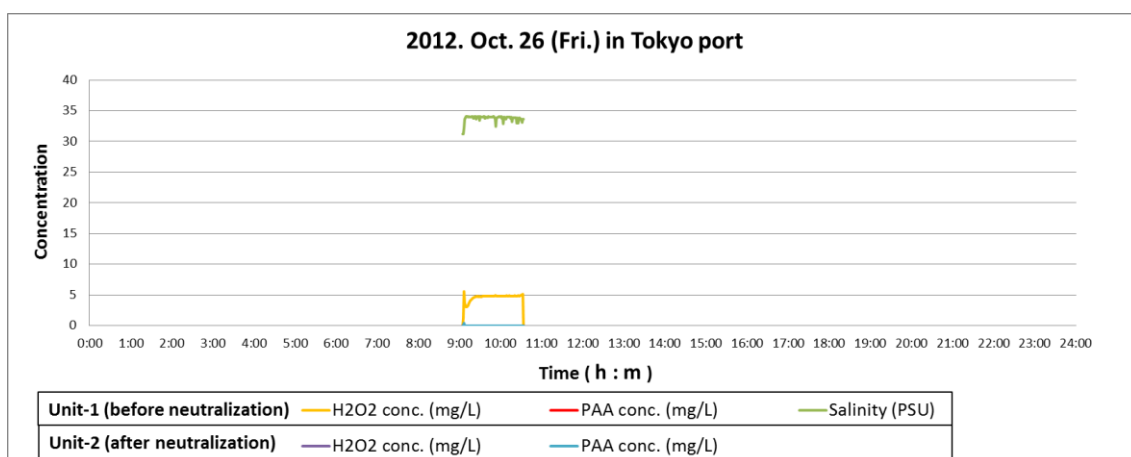
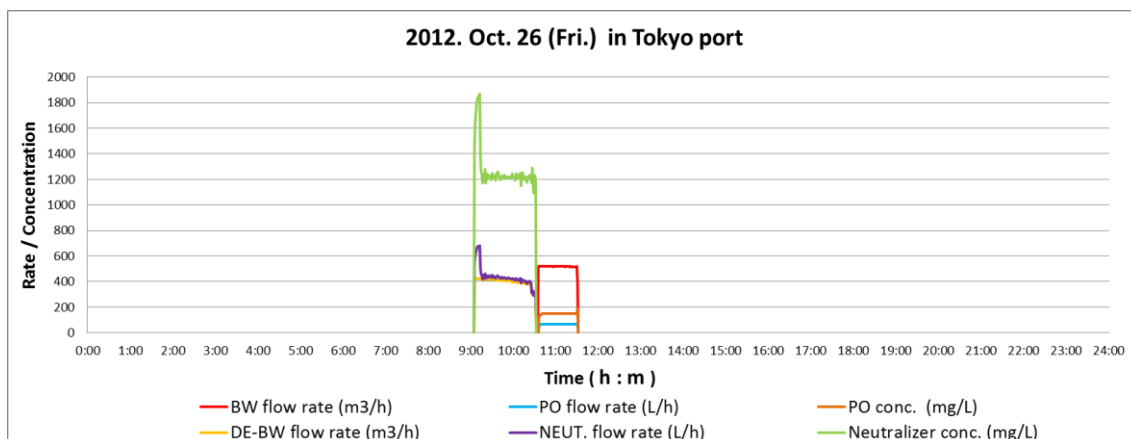


Figure 4-1-1(102) System operation data (2012/10/26)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

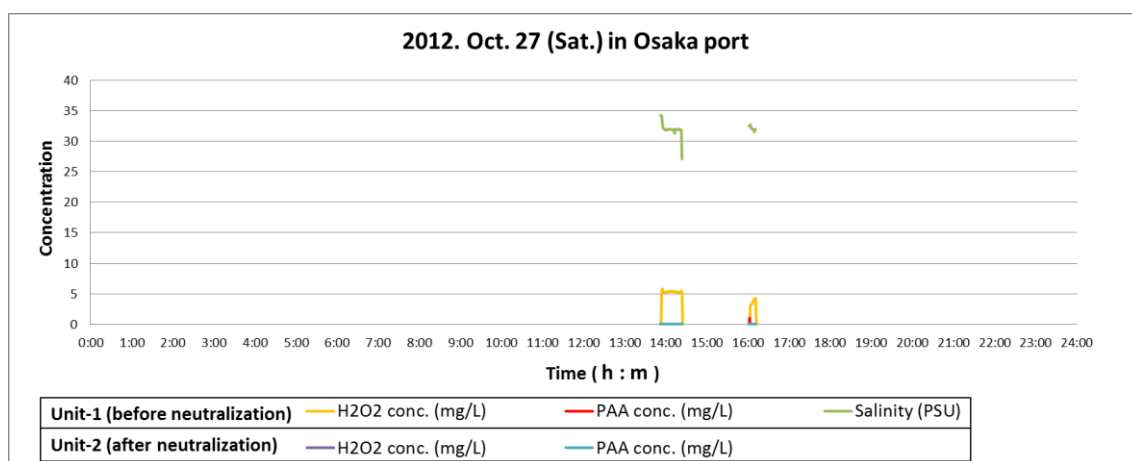
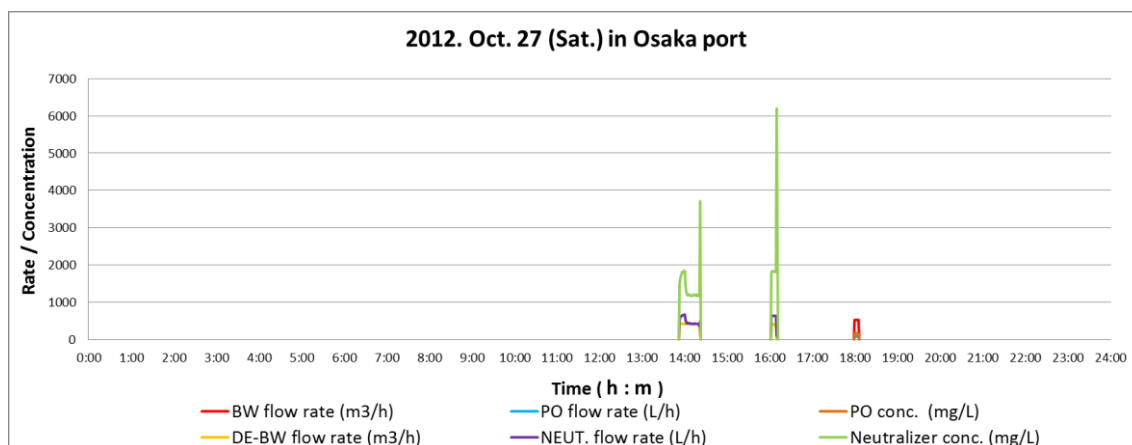


Figure 4-1-1(103) System operation data (2012/10/27)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

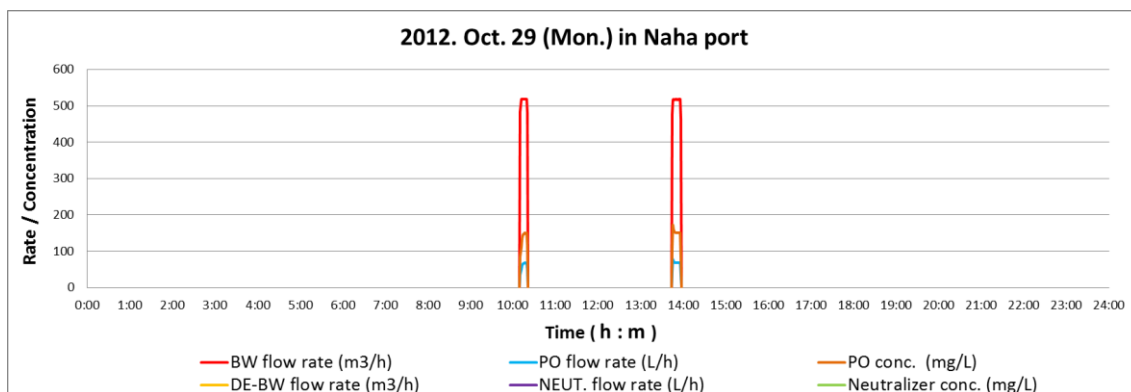


Figure 4-1-1(104) System operation data (201210/29)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

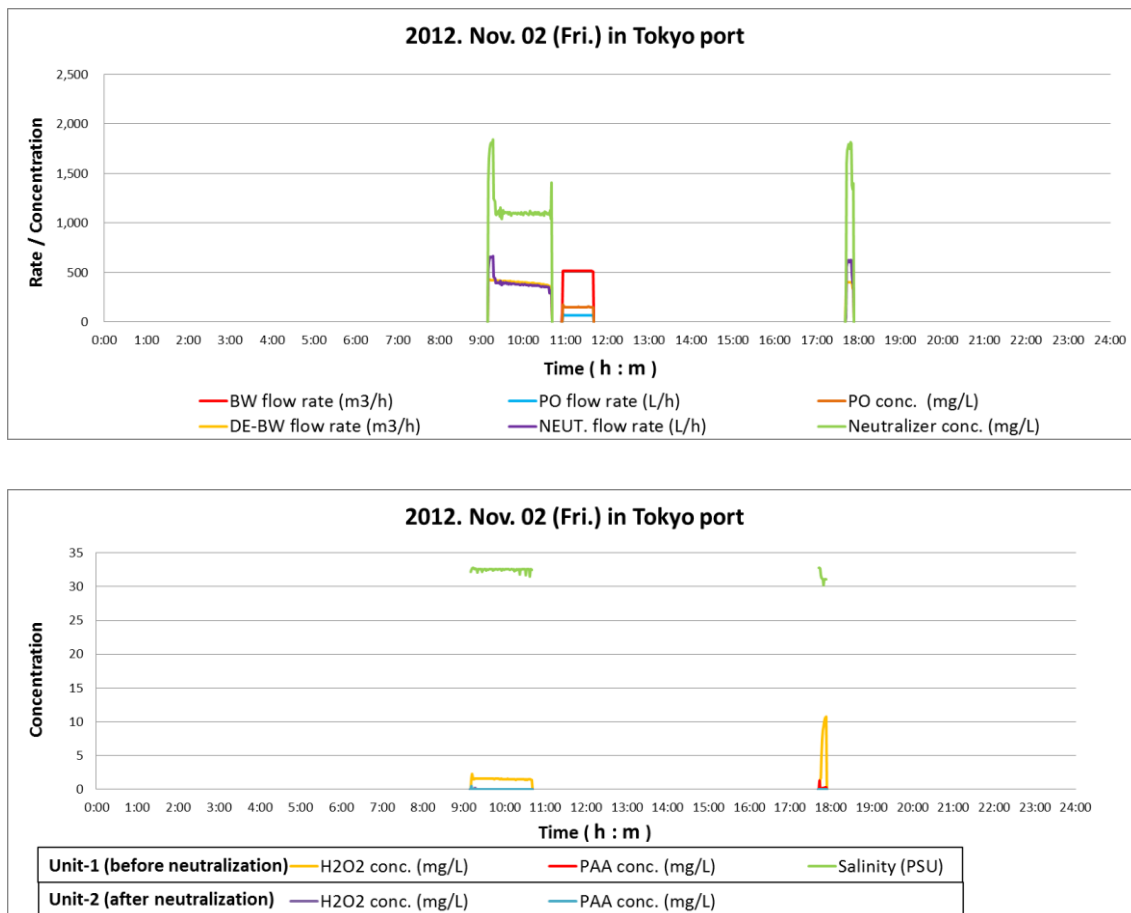


Figure 4-1-1(105) System operation data (2012/11/02)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

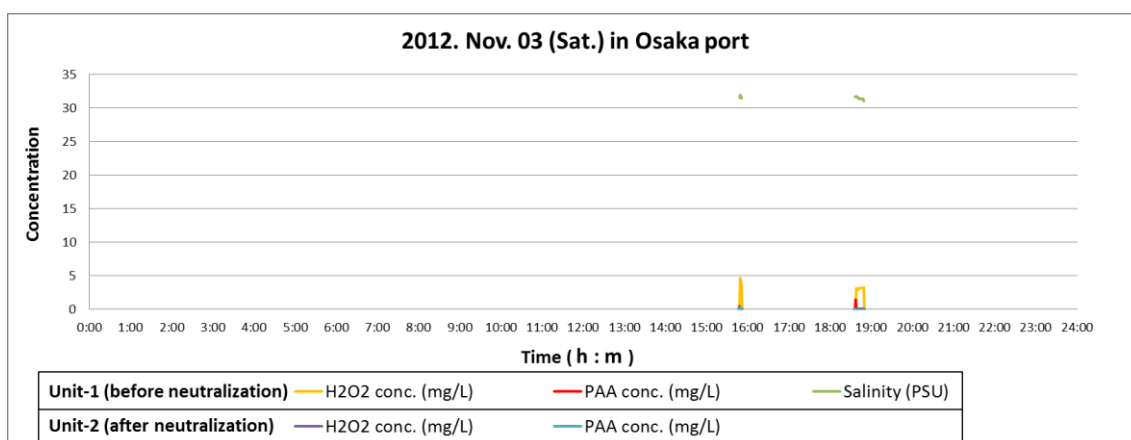
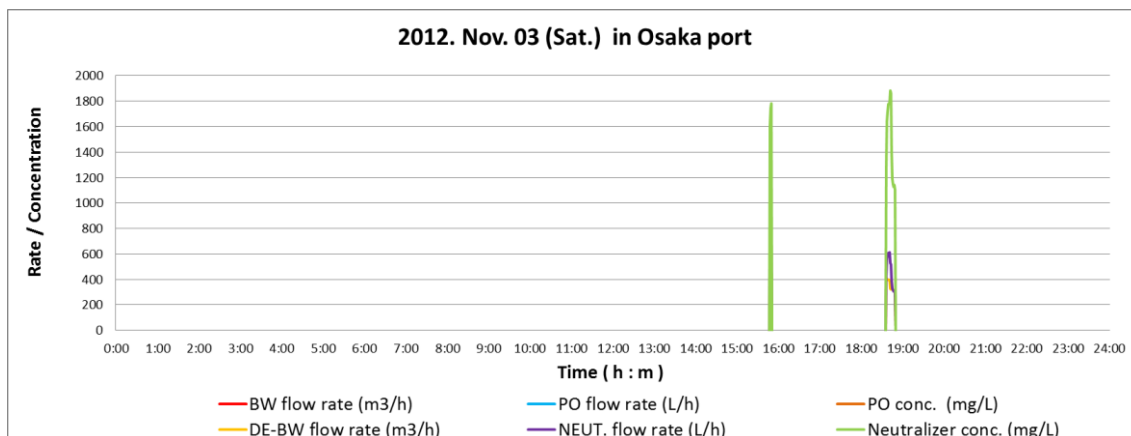


Figure 4-1-1(106) System operation data (2012/11/03)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

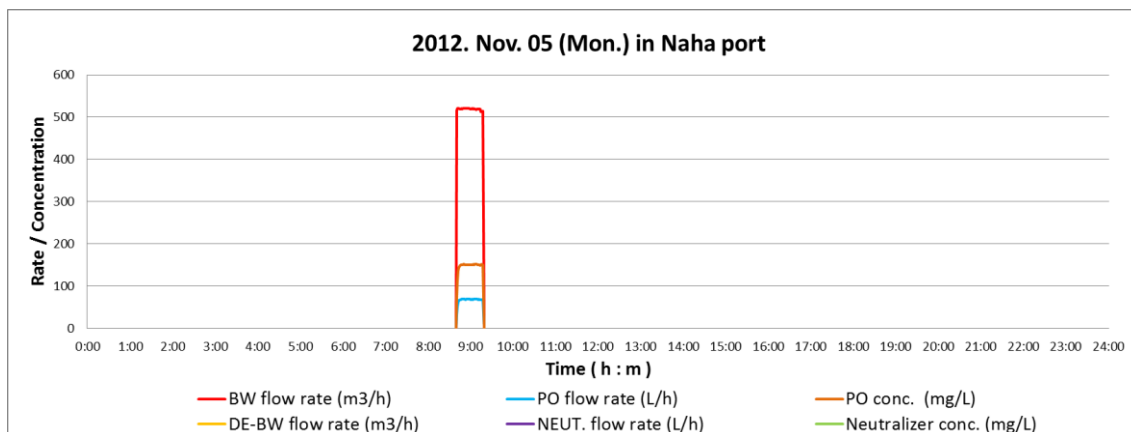


Figure 4-1-1(107) System operation data (2012/11/05)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

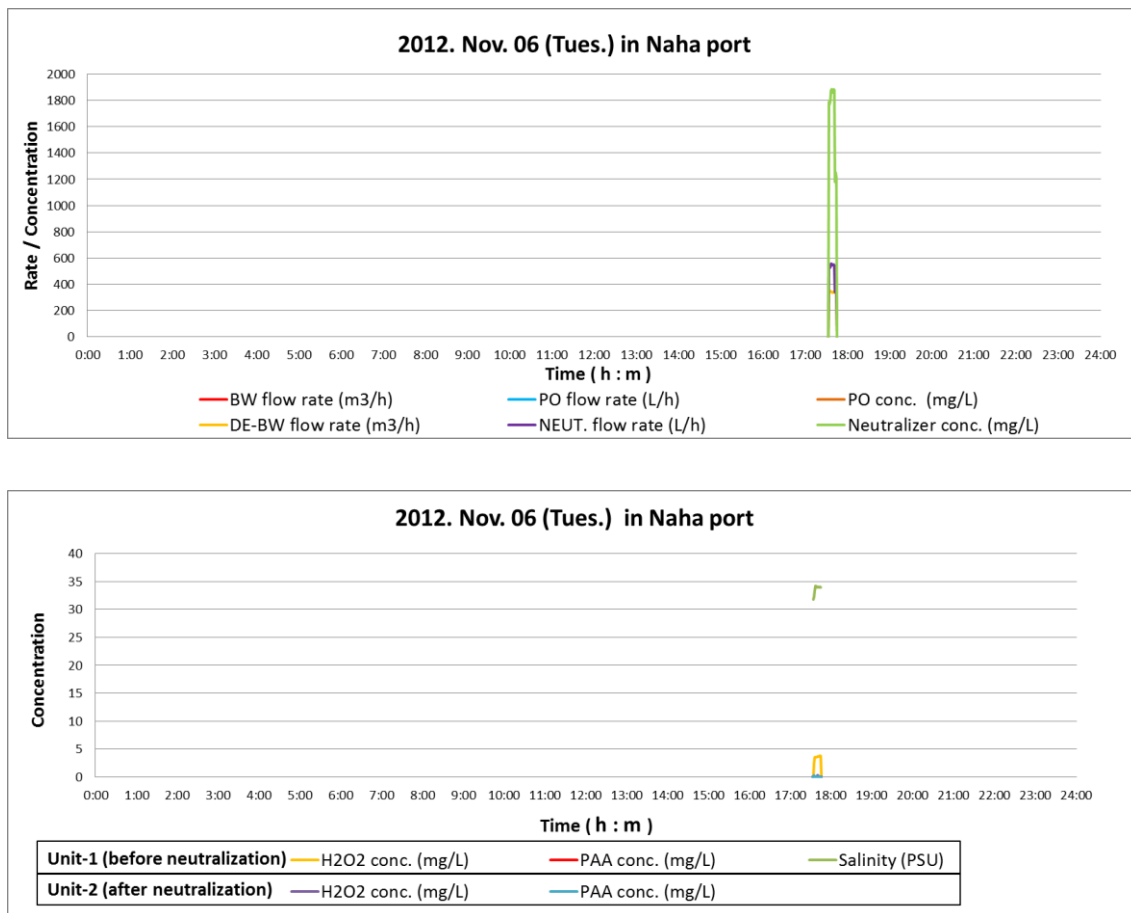


Figure 4-1-1(108) System operation data (2012/11/06)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

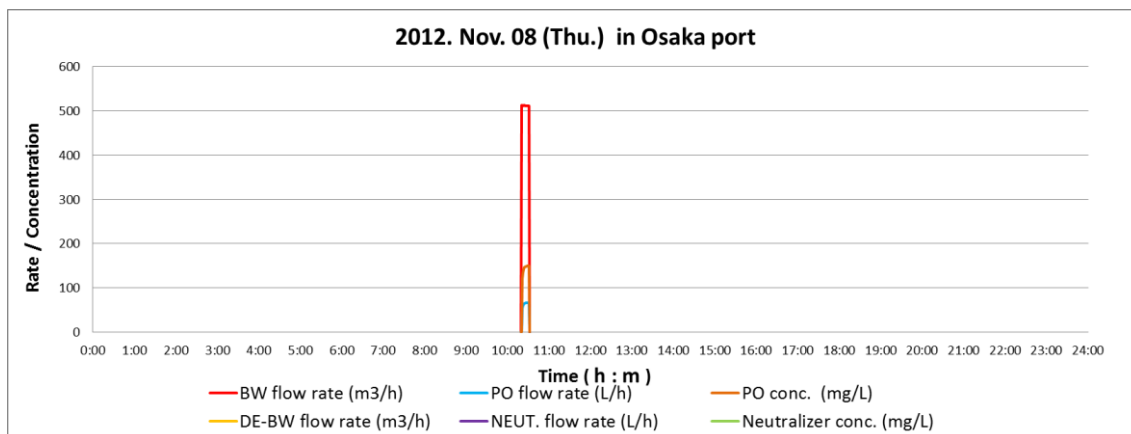


Figure 4-1-1(109) System operation data (2012/11/08)

The above figure shows the flow volume (on ballasting and de-ballasting, medical agents and neutralizers) and the concentration (medical agents, neutralizers). Furthermore, since there was no de-ballasting from the ballast tank, there is no test data (the concentration and salinity before and after neutralization of medical agents (H_2O_2 , PAA)) of the test on de-ballasting.

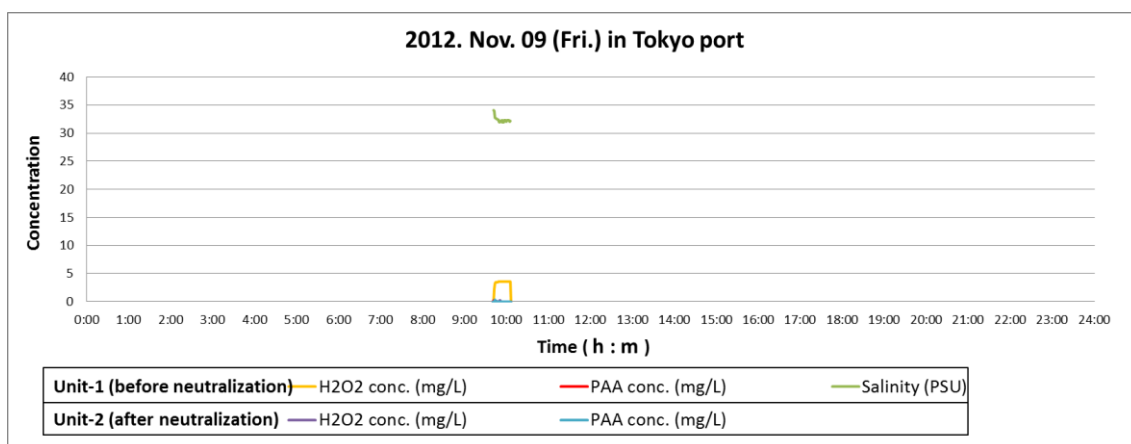
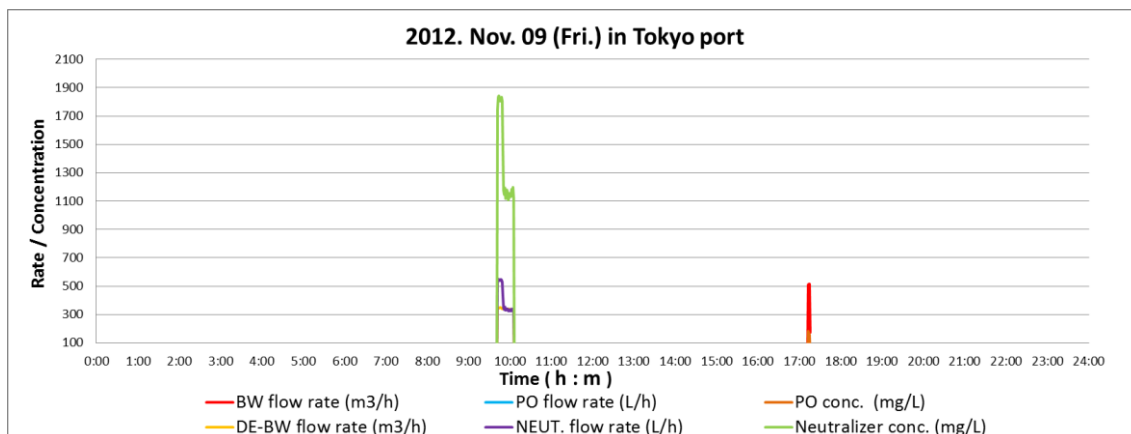


Figure 4-1-1(110) System operation data (2012/11/09)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

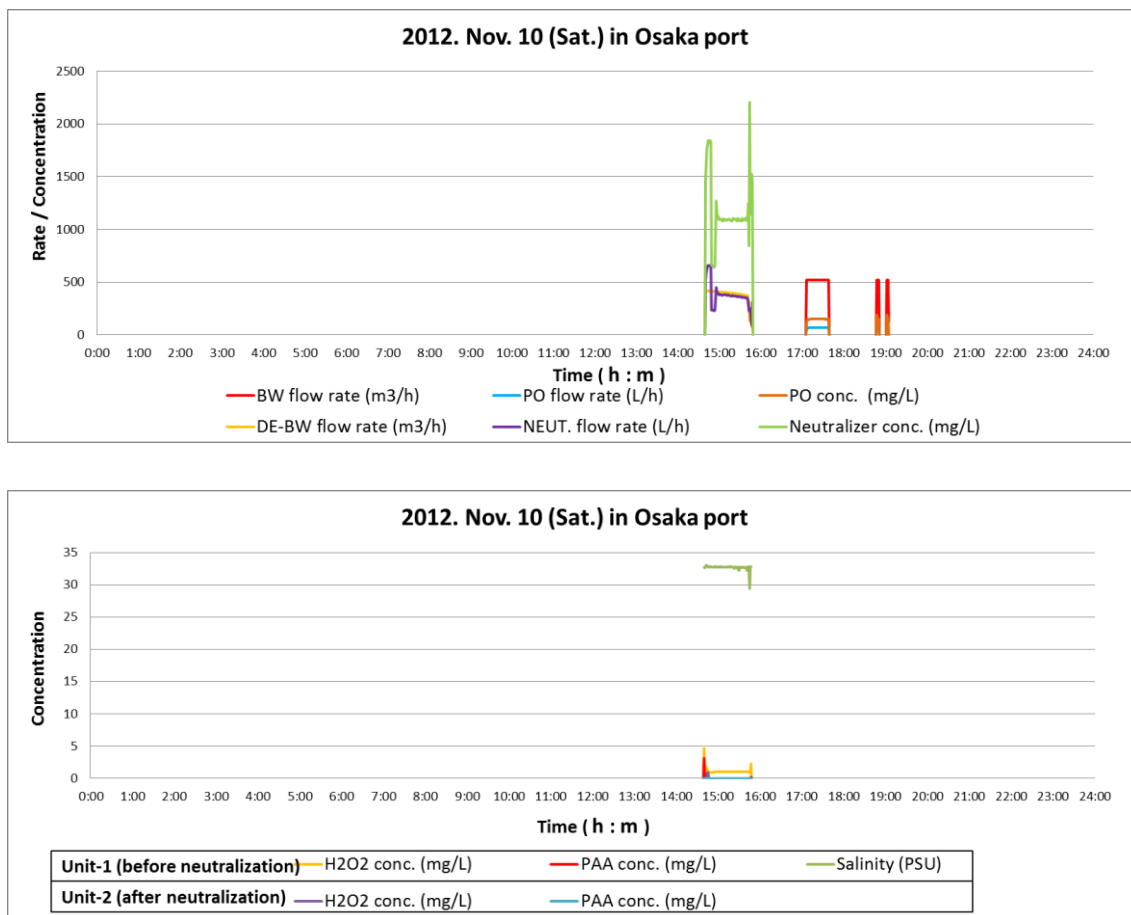


Figure 4-1-1(111) System operation data (2012/11/10)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

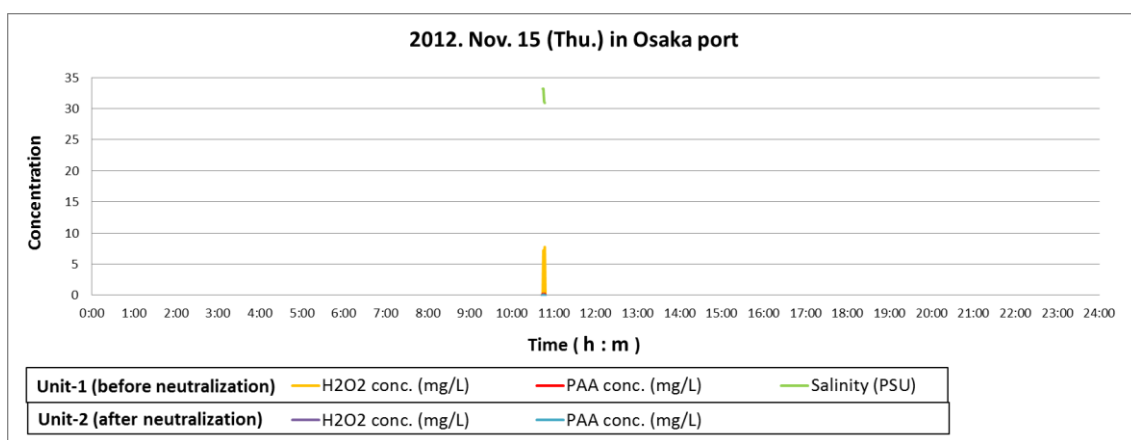
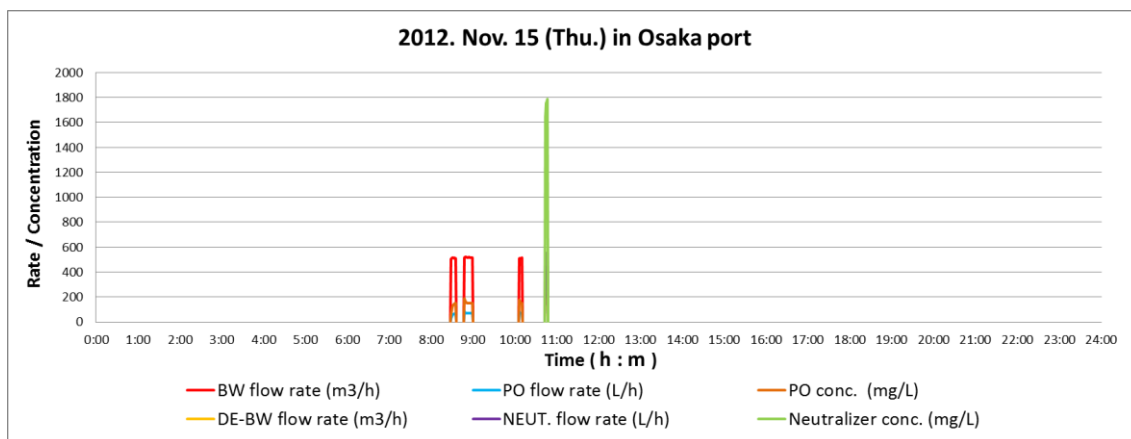


Figure 4-1-1(112) System operation data (2012/11/15)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

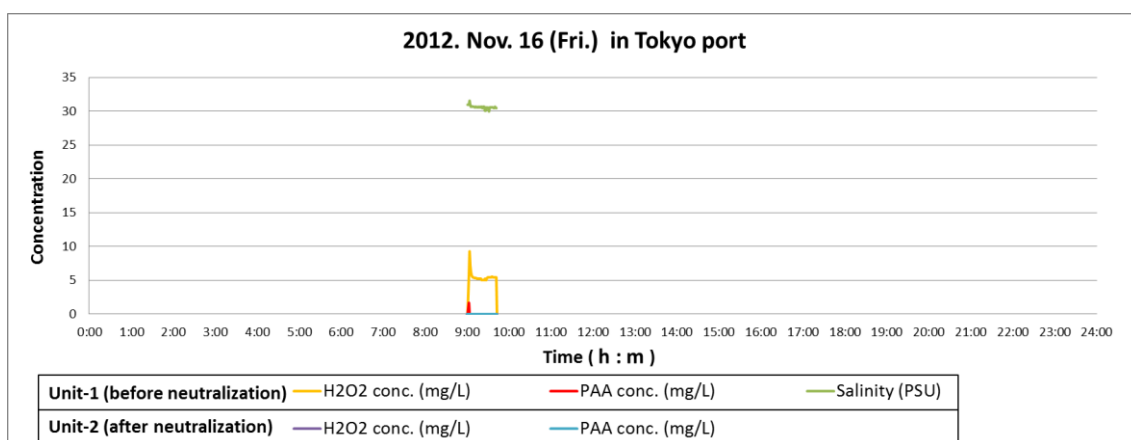
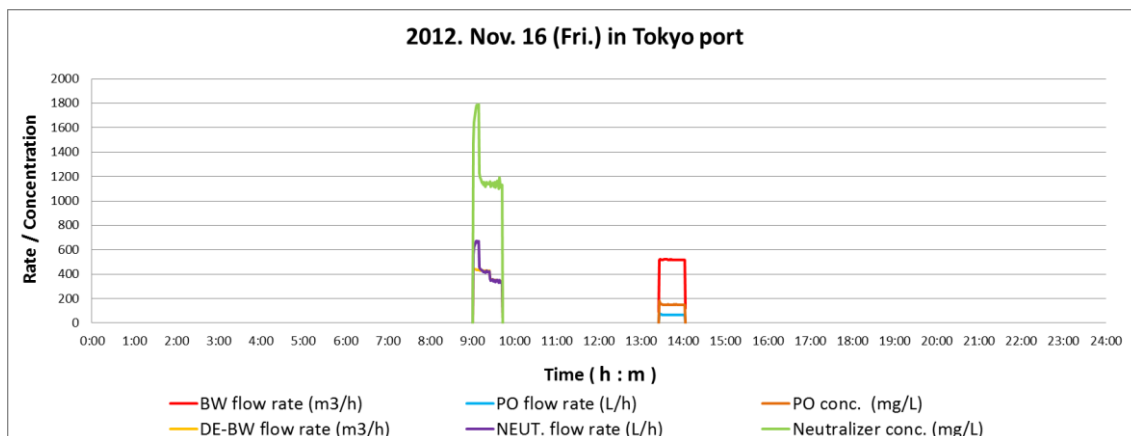


Figure 4-1-1(113) System operation data (2012/11/16)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H_2O_2 , PAA) at the time of de-ballasting.

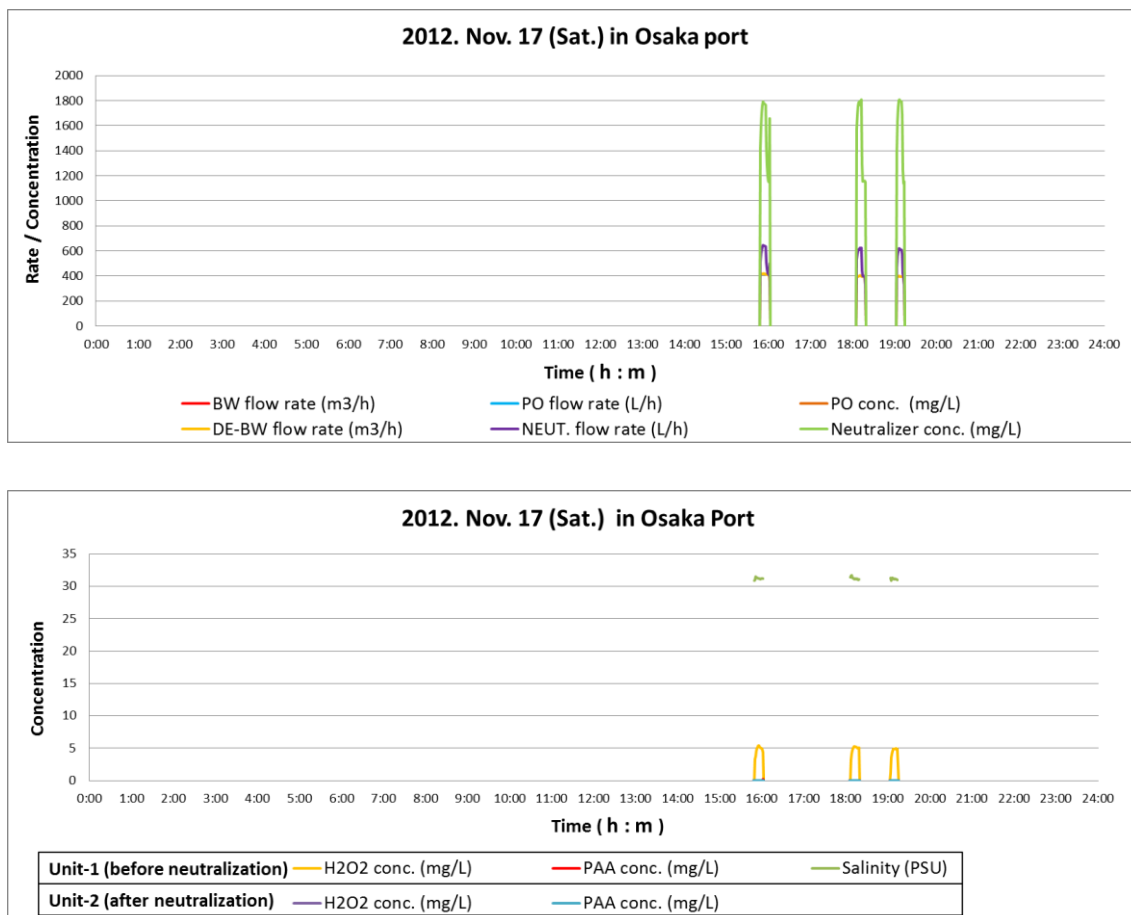


Figure 4-1-1(114) System operation data (2012/11/17)

The above figure shows the flow volume (on ballasting, de-ballasting, medical agents, neutralizers) and the concentration (medical agent, neutralizers), and the following figure shows the concentration and salinity before and after the neutralization of medical agent (H₂O₂, PAA) at the time of de-ballasting.

4.2 PERFORMANCE TEST

The performance test was conducted three times (The date of tests are: the first time Sep. 7, 2012 ballasting and Sep. 8, 2012 de-ballasting, the second time Sep. 21, 2012 ballasting and Sep. 22, 2012 de-ballasting, the third time Oct. 5, 2012 ballasting and Oct. 6, 2012 de-ballasting).

In addition, although a performance test was conducted as Sep. 28, 2012 ballasting and Sep. 29, 2012 de-ballasting, the amount of organisms of S size group of the intended tank (control) did not satisfy the requirements for ship board test on de-ballasting, and it became an invalid test.

The isokinetic flow rate of the sample was conducted from the ballast line, and it was obtained using the sampling device (Defigor).

The test results are shown below.

L SIZE GROUP

(Organisms of greater than or equal to 50 micrometer in minimum dimension)

Table 4-2-1 (1) - (3) show the analysis results of performance tests of L size group for 3 times in total (1st time: Sep. 7, 2012 ballasting and Sep. 8, 2012 de-ballasting, 2nd time: Sep. 21, 2012 ballasting and Sep. 22, 2012 de-ballasting, 3rd time: Oct. 5, 2012 ballasting and Oct. 6, 2012 de-ballasting).

All the samples met the requirements for L size of control water on ballasting (not less than 100 individuals/m³) and on de-ballasting (not less than ten individuals/m³), and the density of the treated water on de-ballasting was less than the ballast water discharged standard (less than ten individuals/m³).

S SIZE GROUP

(Organisms of greater than or equal to 10 micrometers and less than 50 micrometers in minimum dimension)

Table 4-2-1 (1) - (3) show the analysis results of performance tests of S size group for 3 times in total (1st time: Sep. 7, 2012 ballasting and Sep. 8, 2012 de-ballasting, 2nd time: Sep. 21, 2012 ballasting and Sep. 22, 2012 de-ballasting, 3rd time: Oct. 5, 2012 ballasting and Oct. 6, 2012 de-ballasting).

All the samples met the requirements for S size group of control water on ballasting (not less than 100 individuals/ml) and on de-ballasting (not less than ten individuals/ml) and the treated water on de-ballasting was less than the ballast water discharged standard (less than ten individuals/ml).

Table 4-2-1 (1) The first performance test. Analysis results of L size and S size group.
(Sep. 7 & 8, 2012)

Date		2012/9/7			2012/9/8											
Port		Ariake (Ballasting)			Nanko (De-ballasting)											
Sample		Control			Control			Treated water, Beginning			Treated water, Midterm			Treated water, End		
		Beginning	Midterm	End	Beginning	Midterm	End	①	②	③	①	②	③	①	②	③
L size group	Phyla/Division (m ³)	6	8	8	7	6	5	1	1	ND	ND	ND	1	1	2	1
	Species (m ³)	14	13	12	13	14	9	1	1	ND	ND	ND	1	1	2	1
	Density (m ³)	477,300	148,100	274,500	187,670	61,720	69,800	1	1	ND	ND	ND	1	1	3	11
S size group	Phyla/Division (m ³)	4	4	3	3	4	4	1	1	1	1	1	1	1	1	1
	Species (m ³)	11	14	9	6	11	8	1	1	1	2	1	2	1	2	1
	Density (m ³)	320	230	270	190	230	340	0.13	0.19	0.18	0.18	0.19	0.29	0.19	0.34	0.26

ND: no detection of organism

Table 4-2-1 (2) The second performance test. Analysis results of L size and S size group.
(Sep. 21 & 22, 2012)

Date		2012/9/21			2012/9/22											
Port		Ariake (Ballasting)			Nanko (De-ballasting)											
Sample		Control			Control			Treated water, Beginning			Treated water, Midterm			Treated water, End		
		Beginning	Midterm	End	Beginning	Midterm	End	①	②	③	①	②	③	①	②	③
L size group	Phyla/Division (m ³)	7	6	6	6	6	7	ND	ND	ND	ND	ND	ND	1	ND	ND
	Species (m ³)	13	12	12	12	13	11	ND	ND	ND	ND	ND	ND	1	ND	ND
	Density (m ³)	189,700	189,500	129,300	67,080	78,240	73,200	ND	ND	ND	ND	ND	ND	2	ND	ND
S size group	Phyla/Division (m ³)	3	2	3	3	3	4	1	1	1	2	1	1	1	1	2
	Species (m ³)	9	5	5	6	5	7	3	2	1	2	2	3	3	3	3
	Density (m ³)	160	240	140	140	130	140	0.09	0.15	0.11	0.07	0.19	0.15	0.11	0.15	0.21

ND: no detection of organism

Table 4-2-1 (3) The third performance test. Analysis results of L size and S size group.
(Oct. 5 & 6, 2012)

Date		2012/10/5			2012/10/6											
Port		Ariake (Ballasting)			Nanko (De-ballasting)											
Sample		Control			Control			Treated water, Beginning			Treated water, Midterm			Treated water, End		
		Beginning	Midterm	End	Beginning	Midterm	End	①	②	③	①	②	③	①	②	③
L size group	Phyla/Division (m ³)	6	5	5	3	3	3	2	ND	1	1	1	ND	1	1	2
	Species (m ³)	13	12	12	9	10	8	2	ND	1	1	1	ND	1	1	2
	Density (m ³)	36,050	24,050	8,900	6,990	6,490	6,490	2	ND	1	1	1	ND	3	5	2
S size group	Phyla/Division (m ³)	1	2	2	2	1	2	2	3	2	2	4	2	2	2	4
	Species (m ³)	2	4	2	2	1	2	3	4	4	3	5	3	4	3	5
	Density (m ³)	110	140	130	50	40	20	0.46	0.31	0.47	0.74	0.61	0.42	0.23	0.31	0.42

ND: no detection of organism

BACTERIA

The analysis results of bacteria are shown in Table 4-2-2 (1) - (3).

(1) *Escherichia coli*

On de-ballasting, the density of *Escherichia coli* in treated water was less than the ballast water discharged standard (less than 250 cfu/100 ml) in all the samples.

(2) Intestinal *Enterococci*

On de-ballasting, the density of Intestinal *Enterococci* in treated water was less than the ballast water discharged standard (less than 100 cfu/100 ml) in all the samples.

(3) Toxicogenic *Vibrio cholera* (serotype O-1 and O-139)

On de-ballasting, the density of Toxicogenic *Vibrio cholera* (O-1andO-139) in treated water was less than the ballast water discharged standard (less than 1 cfu/100 ml) in all the samples.

Table 4-2-2(1) The first performance test. Analysis results of bacteria
(Sep. 7 & 8, 2012)

		Heterotrophic bacteria (Sea water medium)	Heterotrophic bacteria (Fresh water medium)	<i>Vibrio cholera</i> (First-stage)	<i>Vibrio cholera</i> (Second-stage)	Toxicogenic <i>Vibrio cholera</i>	Coliform	<i>Escherichia coli</i>	Enterococcus group	Intestinal <i>Enterococci</i>
		(cfu/ml)		(cfu/100ml)			(cfu/100ml)			
Treated water	Beginning	①	87,931	62,914	2,400	N.D.	1,024	61	N.D.	N.D.
		②	86,137	54,363	1,000	N.D.	1,278	56	N.D.	N.D.
		③	106,721	53,097	1,600	N.D.	1,248	46	N.D.	N.D.
	Midterm	①	72,414	48,663	2,400	N.D.	1,022	56	N.D.	N.D.
		②	118,227	58,058	1,400	N.D.	1,022	82	N.D.	N.D.
		③	62,703	67,347	2,000	N.D.	1,042	56	N.D.	N.D.
	End	①	92,893	46,024	1,000	N.D.	643	24	N.D.	N.D.
		②	93,421	52,358	2,800	N.D.	683	34	N.D.	N.D.
		③	96,799	54,575	2,000	N.D.	864	42	N.D.	N.D.
Control water	Ballasting	Beginning	73,000	1,236	1,280	N.D.	1,060	N.D.	N.D.	N.D.
		Midterm	82,000	1,620	700	N.D.	1,740	20	N.D.	N.D.
		End	57,200	824	1,160	N.D.	326	20	N.D.	N.D.
	De-ballasting	Beginning	40,400	1,770	1,440	N.D.	328	10	N.D.	N.D.
		Midterm	53,000	1,650	1,080	N.D.	370	6	N.D.	N.D.
		End	57,200	824	1,160	N.D.	326	2	N.D.	N.D.

N.D.: no detection of bacteria

Table 4-2-2 (2) The second performance test. Analysis results of bacteria
(Sep. 21 & 22, 2012)

		Heterotrophic bacteria (Sea water medium)	Heterotrophic bacteria (Fresh water medium)	<i>Vibrio cholera</i> (First-stage)	<i>Vibrio cholera</i> (Second-stage)	Toxicogenic <i>Vibrio cholera</i>	Coliform	<i>Escherichia coli</i>	Enterococcus group	Intestinal <i>Enterococci</i>
		(cfu/ml)		(cfu/100ml)			(cfu/100ml)			
Treated water	Beginning	①	3,472,000	249,000	60	N.D.	208	3	N.D.	N.D.
		②	3,748,000	245,600	240	N.D.	186	6	N.D.	N.D.
		③	4,520,000	231,800	120	N.D.	164	4	N.D.	N.D.
	Midterm	①	4,004,000	217,200	60	N.D.	174	11	N.D.	N.D.
		②	3,810,000	218,000	60	N.D.	239	8	N.D.	N.D.
		③	3,842,000	225,400	40	N.D.	196	6	N.D.	N.D.
	End	①	3,824,000	223,600	140	N.D.	221	3	N.D.	N.D.
		②	3,592,000	217,800	60	N.D.	243	2	N.D.	N.D.
		③	3,016,000	207,000	40	N.D.	157	4	N.D.	N.D.
Control water	Ballasting	Beginning	61,400	476	1,100	N.D.	600	20	N.D.	N.D.
		Midterm	47,000	458	800	N.D.	520	60	N.D.	N.D.
		End	55,800	446	440	N.D.	1,120	N.D.	N.D.	N.D.
	De-ballasting	Beginning	159,600	2,520	980	N.D.	140	8	N.D.	N.D.
		Midterm	37,400	968	600	N.D.	126	4	N.D.	N.D.
		End	41,200	1,014	720	N.D.	160	4	N.D.	N.D.

N.D.: no detection of bacteria

Table 4-2-2 (3) The third performance test Analysis results of bacteria
(Oct. 5 & 6, 2012)

		Heterotrophic bacteria (Sea water medium)	Heterotrophic bacteria (Fresh water medium)	<i>Vibrio cholera</i> (First-stage)	<i>Vibrio cholera</i> (Second-stage)	Toxicogenic <i>Vibrio cholera</i>	Coliform	<i>Escherichia coli</i>	Enterococcus group	Intestinal <i>Enterococci</i>
		(cfu/ml)		(cfu/100ml)			(cfu/100ml)			
Treated water	Beginning	①	3,860,000	13,100	1,036	N.D.	592	84	N.D.	N.D.
		②	3,540,000	16,740	1,032	N.D.	294	32	N.D.	N.D.
		③	3,940,000	18,160	1,142	N.D.	444	54	N.D.	N.D.
	Midterm	①	4,120,000	12,860	1,050	N.D.	398	28	N.D.	N.D.
		②	3,740,000	21,600	1,538	N.D.	368	32	N.D.	N.D.
		③	3,400,000	19,480	1,112	N.D.	370	38	N.D.	N.D.
	End	①	3,660,000	19,180	1,642	N.D.	248	32	N.D.	N.D.
		②	3,360,000	15,000	1,534	N.D.	506	44	N.D.	N.D.
		③	3,040,000	15,600	1,548	N.D.	418	36	N.D.	N.D.
Control water	Ballasting	Beginning	25,800	758	5,240	N.D.	4,060	540	N.D.	N.D.
		Midterm	27,400	924	674	N.D.	700	70	N.D.	N.D.
		End	22,400	1,008	820	N.D.	786	82	N.D.	N.D.
	De-ballasting	Beginning	796,000	2,480	25,000	N.D.	32,200	6,200	N.D.	N.D.
		Midterm	794,000	2,500	25,800	N.D.	23,600	4,000	N.D.	N.D.
		End	764,000	3,120	26,000	N.D.	20,600	2,400	N.D.	N.D.

N.D.: no detection of bacteria

WATER QUALITY

In Table 4-2-3, we have shown the measuring results of water temperature and salinity as well as the measurement results of pH, NTU (turbidity), TSS (total suspended solids) and POC (particulate organic carbon), which are required for record at the time of shipboard test.

Table 4-2-3 (1) The first performance test. Analysis results of water quality

Port (Date)	Condition		Water temperature (℃)	Salinity (PSU)	pH	NTU	TSS (mg/L)	POC (mg/L)	
Ariake (2012.09.07)	Control Ballasting	Beginning	27.3	28.5	7.2	39.0	5.3	<0.1	
		Midterm	27.3	28.4	7.2	11.6	5.3	0.2	
		End	27.6	28.0	7.2	16.4	4.2	0.2	
Nanko (2012.09.08)	Control De-ballasting	Beginning	28.2	28.9	7.1	2.0	2.8	0.1	
		Midterm	28.2	28.9	7.2	2.4	4.2	0.1	
		End	28.1	28.9	7.2	11.0	2.9	<0.1	
	Treated water De-ballasting	Beginning	①	28.0	30.0	6.1	3.7	3.2	1.0
			②	29.9	30.0	6.1	9.1	6.5	1.2
			③	27.9	30.0	6.1	5.7	4.9	1.0
		Midterm	①	27.9	30.0	6.1	4.3	3.0	0.6
			②	27.9	30.1	6.1	4.8	5.0	0.4
			③	27.9	30.1	6.1	4.3	3.4	0.7
		End	①	27.9	30.1	6.1	7.7	3.3	0.6
			②	27.9	30.1	6.1	6.9	7.4	0.9
			③	27.9	30.1	6.1	7.0	4.7	0.6

Table 4-2-3 (2) The second performance test. Analysis results of water quality

Port (Date)	Condition		Water temperature (℃)	Salinity (PSU)	pH	NTU	TSS (mg/L)	POC (mg/L)	
Ariake (2012.09.21)	Control Ballasting	Beginning	27.3	27.9	7.2	22.7	4.3	<0.1	
		Midterm	27.1	28.4	7.3	13.6	4.3	0.2	
		End	27.2	28.4	7.3	13.0	2.6	0.1	
Nannko (2012.09.22)	Control De-ballasting	Beginning	26.3	27.2	7.6	2.5	2.6	0.1	
		Midterm	26.2	27.3	7.6	2.6	4.0	0.5	
		End	26.2	27.2	7.6	2.7	2.8	1.0	
	Treated water De-ballasting	Beginning	①	26.4	28.1	6.5	8.6	4.6	0.4
			②	26.2	28.1	6.5	8.8	4.2	<0.1
			③	26.1	27.9	6.5	8.9	3.4	0.5
		Midterm	①	26.2	28.1	6.5	9.1	3.6	0.7
			②	26.2	28.1	6.6	9.3	3.6	0.8
			③	26.1	28.1	6.6	8.9	1.9	0.2
		End	①	26.2	27.9	6.6	8.9	4.1	1.2
			②	26.2	27.9	6.6	9.3	4.8	0.4
			③	26.2	28.0	6.5	9.2	2.8	0.8

Table4-2-3 (3) The third performance test. Analysis results of water quality

Port (Date)	Condition		Water temperature (°C)	Salinity (PSU)	pH	NTU	TSS (mg/L)	POC (mg/L)	
Ariake (2012.10.05)	Control Ballasting	Beginning	23.0	30.8	7.3	14.6	4.1	<0.1	
		Midterm	22.9	31.8	7.3	5.5	3.3	0.1	
		End	23.1	30.7	7.4	3.3	2.7	<0.1	
Nanko (2012.10.06)	Control De-ballasting	Beginning	24.5	29.7	7.6	2.1	4.5	0.1	
		Midterm	24.4	29.7	7.6	2.1	2.8	0.1	
		End	24.4	29.7	7.6	2.0	2.9	0.1	
	Treated water De-ballasting	Beginning	①	24.2	30.3	6.6	5.4	3.6	0.1
			②	24.2	30.2	6.6	4.6	4.3	0.4
			③	24.2	30.3	6.7	4.7	3.8	0.4
		Midterm	①	24.2	30.1	6.6	4.9	3.2	0.8
			②	24.2	30.3	6.7	5.0	4.3	1.3
			③	24.2	30.2	6.7	4.8	3.9	0.7
		End	①	24.2	30.3	6.6	4.8	2.9	0.7
			②	24.2	30.3	6.7	5.0	4.6	0.7
			③	24.2	30.3	6.7	4.9	3.4	0.8